

THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 77

JUNE, 1947

No. 2

CYATHEA IN NEW GUINEA¹

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FIFTEEN PLATES

The reasons provided by its present distribution for ascribing to *Cyathea* an Antarctic origin have been presented in this Journal.² In the same study, it was pointed out that migrants from Antarctica by the most open route to the Oriental tropics found in New Guinea their first opportunity for rich development under present climatic conditions. The hypothesis of Antarctic origin thus explains New Guinea's wonderful wealth and diversity of species in such a genus as *Grammitis*; and conversely, the local wealth of species endorses the hypothesis.

Cyathea is another such genus. In the enumeration to follow, I list 88 species—far more than are credited to any other like area. This list includes one species that is fairly surely reported there by error; two which I am unable to place in any systematic arrangement; three which may be misidentified; and still several so incompletely described that they may possibly be present under two names. Still, the number known can hardly be less than 80; since, if the species reported, for example, as *C. extensa* be not

¹ This paper includes a report on the ferns of this genus collected by the Third Archbold Expedition to New Guinea. For previous reports of this series, see Phil. Jour. Sci. 73 (1940) 345-357, 457-469; 75 (1941) 347-361; 76 (1941) 23-25.

Printer's proof of this paper was returned to Manila October 15, 1941. To protect the names, diagnoses of the new species were published in University of California Publications in Botany 18 (1942) 218, 219. I would not slander these diagnoses by saying that the descriptions and illustrations now published are necessary for the confident recognition of these species.

² Phil. Jour. Sci. 70 (1939) 180.

that species, it is probably another underscribed one. On the other hand, Brass's most recent collection, numbering 35, includes 15 described here as new, and such a proportion of novelties proves that the number still to be discovered is very large.

The genus is diversified, as well as rich in numbers, here. The dimorphous species constitute a considerable group. Several species are scandent, a phenomenon unknown elsewhere. One species is described as acaulescent; but the best of collectors might not be sure that this condition could not be outgrown. A considerable number of species have fronds remarkably small, for *Cyathea*.

One of these small-leaved species, *C. atrispora* Domin, was first named *Alsophila dryopteroides* Brause. Brause satisfied himself that he saw a complete annulus. There is usually no difficulty in being sure as to any number of sporangia of a *Cyathea*; they are recognizable at a glance. A plant of Brass's collection, a tree-fern assigned at first to *Cyathea* without question, presented me the same problem; and I am assigning it to *Dryopteris*, in spite of one annulus which passed around the pedicel. Even if my observation and my assignment of the species are correct, it is as well not to be hasty in drawing conclusions.

At least throughout the Old World, most species of *Cyathea* are of very limited range, many of them known, each from a single mountain. They seem to be very incapable migrants. In harmony with this idea, is my experience with their spores, which I have tried very many times to germinate, but without success. The total number of individual collections of *Cyathea* in New Guinea is too small to justify any general conclusions as to their domestic range. Only as to the species of great altitudes it is worthy of note that several are now known from "Papua" and from Dutch New Guinea, respectively, at the east and west ends of the island.

As to the endemism of the island as a whole, it is very high. My list includes the off-shore islets—Aru, Run, Woodlark, even to the Louisiade Archipelago, which ought perhaps to be excluded. Only two well-known Malayan species, *C. contaminans* and *C. crenulata*, are known in New Guinea. The former is a group, rather than a species, but some of its New Guinea components occur also far to the west and northwest. The plant which has been reported as a variety of *C. tomentosa* is *C. ordinata*, a very distinct species. Two Polynesian species and one of New Caledonia have been reported, two of these from

the Louisiades only. As to all of these I am in doubt,—which is all that is permitted until one may compare the specimens named by Baker and Christ with authentic specimens of the species in question. Accepting all undisproved statements as to species common to New Guinea and to other lands, the local endemism seems to be above 90 per cent.

The most pleasing fact in work with New Guinea *Cyathea* is that a large part of the species have been described within the last thirty years, which is the period within which it has become usual to collect specimens which permit reasonably complete description. Brass's specimens sent me for study invariably include the base of the stipe, which is now recognized as essential for the purpose of description. No other land rich in *Cyathea* has so large a part of its species authentically known with this measure of completeness. These massive bases are indeed not convenient in the herbarium; but convenience is a very minor consideration, compared with the demand that the specimen gives as complete an idea as possible of the plant. Even this paramount demand can hardly be made to cover the trunk. In my own collections, for my own herbarium, are many pieces of trunk; but in collections by others, I am content, besides as much as possible of the lamina, with the stipe, and good field notes, as we have to be with trees of other kinds. In the descriptions of new species, to follow, the information in Brass's field notes is to be regarded as a part of each description.

Key to the species of Cyathea.

- a*¹. Indusium present.
 - b*¹. Pinnae 5–15 cm long; frond bipinnatifid.
 - c*¹. Pinnae 15 cm long 1 *C. fusca*.
 - c*². Pinnae 5–8 cm long.
 - d*¹. Sorus bursting at apex 74. *C. Klossii*.
 - d*². Indusium breaking up everywhere 75. *C. papuana*.
 - b*². Pinnules up to 3 cm long, flat, thin.
 - c*¹. Stipe less than 5 cm long 70. *C. peranemiformis*.
 - c*². Stipe longer.
 - d*¹. Costae of pinnules hairy 66. *C. hunsteiniana*.
 - d*². Costae naked 67. *C. Ledermanni*.
 - d*³. Costae squamulose.
 - e*¹. Squamulae not bullate 68. *C. microphylloides*.
 - e*². Squamulae mostly bullate 69. *C. perpelvigera*.
 - b*³. Pinnules 1 cm long, coriaceous, not bullate 81. *C. arfakensis*.
 - b*⁴. Pinnules under 4 cm long, more or less bullate.
 - c*¹. Frond lanceolate, bipinnate 81. *C. arfakensis*.
 - c*². Frond lanceolate, tripinnatifid 80. *C. imbricata*.
 - c*³. Frond lanceolate to ovate, tripinnate.

- d*¹. Basal paleae flat, pale-marginate 77. *C. cheilanthoides*.
*d*². Basal paleae twisted or crinite, concolorous.
 *e*¹. Secondary pinnules mostly oblong 78. *C. Macgregori*.
 *e*². Secondary pinnules mostly round 79. *C. gleichenioides*.
*c*⁴. Frond broadly ovate, quadripinnate 76. *C. Keysseri*.
*b*⁵. Pinnules larger, segments bullate or cucullate 34. *C. ordinata*.
*b*⁶. Pinnules larger, not bullate nor deeply cut.
 *c*¹. Indusium firm 1. *C. fusca*.
 *c*². Indusium membranous 2. *C. Wernerii*.
*b*⁷. Pinnules over 4 cm long, not bullate, deeply pinnatifid or pinnate at base only.
 *c*¹. Segments 4 mm wide or wider.
 *d*¹. Tomentum on rachis not mixed with paleae.
 *e*¹. Pinnae up to 35 cm long 3. *C. Rosenstockii*.
 *e*². Pinnae up to 55 cm long 4. *C. runensis*.
 *d*². Tomentum mixed with linear paleae 5. *C. subspathulata*.
 *c*². Segments less than 4 mm wide.
 *d*¹. Costa of pinnule naked beneath.
 *e*¹. Secondary rachises naked beneath 6. *C. pruinosa*.
 *e*². Secondary rachises very scaly 7. *C. costalisora*.
 *d*². Costa bearing bullate paleae only.
 *e*¹. Sori costular 8. *C. geluensis*.
 *e*². Sori medial 9. *C. novoguineensis*.
 *d*³. Costa bearing bullate and narrow flat paleae.
 8. *C. geluensis* var. *tomentosa*.
 *d*⁴. Costa bearing mixed dark-setulose paleae 13. *C. Foersteri*.
 *d*⁵. Costa bearing bullate and large flat paleae.
 *e*¹. Paleae on costa dense 11. *C. rigens*.
 *e*². Paleae on costa sparse 12. *C. everta*.
 *d*⁶. Costa scaly and hairy 10. *C. sepikensis*.
 *d*⁷. Costa hairy, without scales 14. *C. cincinnata*.
*b*⁸. Pinnules ample, not bullate, pinnate.
 *c*¹. Upper surface of lamina white-squamulose 15. *C. procera*.
 *c*². Upper surface bearing white fibers.
 *d*¹. Secondary pinnules entire or subentire 16. *C. albidosquamata*.
 *d*². Secondary pinnules pinnatifid 71. *C. pulcherrima*.
 *c*³. Upper surface naked.
 *d*¹. Secondary pinnules not deeply cut.
 *e*¹. Tertiary rachis (costa of primary pinnule) glabrescent.
 *f*¹. Segments deeply crenate 17. *C. Muelleri*.
 *f*². Segments entire 52. *C. fugax*.
 *e*². Tertiary rachis scaly beneath.
 *f*¹. Pinnules sparsely squamulose beneath.
 *g*¹. Secondary pinnules incised.
 *h*¹. Rachis furfuraceous 18. *C. Archboldii*.
 *h*². Rachis long-scaly 19. *C. bidentata*.
 *g*². Secondary pinnules entire to crenulate.
 *h*¹. Rachis 6 mm thick at base 20. *C. globosora*.
 *h*². Rachis over 15 mm thick 21. *C. pachyrrhachis*.
 *f*². Pinnules densely tomentose beneath 22. *C. percrassa*.
 *d*². Secondary pinnules deeply cut at base.

- e*¹. Secondary pinnules 2 mm wide above base.... 23. *C. auriculifera*.
*e*². Secondary pinnules wider (over 3 mm) 24. *C. macrophylla*.
*d*³. Lower secondary pinnules subpinnate.. 25. *C. quadripinnatifida*.
*a*². Indusium wanting or reduced to a concealed scale.
*b*¹. Fertile and sterile pinnules not very unlike.
*c*¹. Trunk erect and self-supporting.
*d*¹. Pinnæ pinnatifid.
*e*¹. Veinlets less than 15 pairs 56. *C. atrispora*.
*e*². Veinlets 30 pairs 83. *C. Woodlarkensis*.
*d*². Pinnules up to 3 cm long.
*e*¹. Pinnules pinnatifid at base only 84. *C. recurvata*.
*e*². Pinnules pinnatifid or pinnate throughout.
*f*¹. Segments bullate 82. *C. tomentosissima*.
*f*². Segments flat.
*g*¹. Paleae on stipe fuscous, broad 72. *C. lepidoclada*.
*g*². Paleae stramineous, 1-2 mm wide 73. *C. parva*.
*d*³. Pinnules larger, with at most one secondary pinnule.
*e*¹. Segments 7 mm wide 26. *C. marginata*.
*e*². Segments about 4 mm wide.
*f*¹. Rachis smooth.
*g*¹. Rachis scaly beneath 27. *C. rubiginosa*.
*g*². Rachis naked beneath 29. *C. Macgillivrayi*.
*f*². Rachis muricate.
*g*¹. Rachis scaly beneath 28. *C. albidula*.
*g*². Rachis pubescent beneath 30. *C. geppiana*.
*e*³. Segments less than 4 mm wide.
*f*¹. Rachis smooth 31. *C. Wilkesiana*.
*f*². Rachis rough.
*g*¹. Costae persistently paleate beneath.
*h*¹. Texture herbaceous, thin 32. *C. scaberula*.
*h*². Texture firm to coriaceous.
*i*¹. Costal paleae dark or mixed.
*j*¹. Pinnules stalked 33. *Als. arfakensis*.
*j*². Pinnules sessile.
*k*¹. Larger paleae entire 34. *C. ordinata*.
*k*². Paleae lacerate 35. *C. magna*.
*i*². Costal paleae all pale.
*j*¹. Larger paleae 2-5 mm long 36. *C. horridula*.
*j*². Paleae up to 1 mm long.
*k*¹. Frond dark green 37. *C. scabriseta*.
*k*². Frond light green 38. *C. Brassii*.
*g*². Costae naked or glabrescent beneath.
*h*¹. Basal scales ferruginous or paler.
*i*¹. Texture herbaceous 39. *C. scaberulipes*.
*i*². Firm to coriaceous.
*j*¹. Veins persistently hairy beneath.... 40. *C. pilulifera*.
*j*². Veins deciduously hairy 41. *C. aeneifolia*.
*j*³. Veins not hairy.
*k*¹. Sori costular 42. *C. gregaria*.
*k*². Lower sori medial 43. *C. tenuicaulis*.

Known only in eastern New Guinea (Papua): *King* 181, 277 (type of *C. Kingii* Ros.), 376, 383; *Brass* 5137. In full development, this species has pinnæ up to 40 cm long, pinnules up to 8 cm long, cut 2/3 of the way to the costa into broad, rounded or obliquely acute lobes. *King* 383 has pinnæ 15 cm long, merely deeply lobed, but I feel sure that it is a form of the same species. *Brass* 5137 has a long series of pinnatifid basal pinnæ, above which it is widened and bipinnatifid. The pinnæ are more or less distinctly articulate to the rachis.

2. *CYATHEA WERNERI* Ros.

C. Werneri ROS., Fedde's Repert. 5 (1908) 34.

C. Versteegii CHRIST, Nova Guinea 8 (1909) 161.

KAISER-WILHELMSLAND: Damun, altitude 500 meters, *Werner* 66, isotype in Herb. Univ. Calif.; *Schlechter* 16388. The type of *C. Versteegii* is *Versteeg* 1190, not seen. Aside from the fact that I cannot distinguish these two species, neither is very distinct from *C. fusca*. Because its indusium is fugitive, I refer here *Carr* 12133, very large, received as *C. fusca*.

3. *CYATHEA ROSENSTOCKII* Brause.

C. Rosenstockii BRAUSE, Engler's Jahrb. 56 (1920) 49.

Sepik region, altitude 1,300 meters, *Ledermann* 11264, isotype in Herb. Univ. Calif.; Idenburg River, altitude 1,750 meters, *Brass* 12275.

4. *CYATHEA RUNENSIS* v. A. v. R.

C. runensis v. A. v. R., Bull. Dept. Agr. Indes Neerl. No. 18 (1908) 1.

Pulu Run, northwest of New Guinea, *Teysmann*; known by the one collection.

5. *CYATHEA SUBSPATHULATA* Brause.

C. subspathulata BRAUSE, Engler's Jahrb. 56 (1920) 53.

Sepik region, altitude 2,070 meters, *Ledermann* 11623, not seen.

6. *CYATHEA PRUINOSA* Ros.

C. pruinosa ROS., Fedde's Repert. 12 (1913) 163.

Bolan Mts., altitude 2,400 to 3,000 meters, *Keysser* (1912) B. 44, isotype in Herb. Univ. Calif.; not again reported.

7. *CYATHEA COSTALISORA* Copeland. Plate 1.

C. costalisora COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Arbor, trunco teste Brassio 4 m alto, sursum 6 cm crasso; stipite ca. 25 cm longo, ubique rhachique paleis 1-2 cm longis anguste linearibus vel acicularibus atris brunneo-marginatis dense vestitis; lamina 70 cm longa, 35 cm lata, acuta, tripinnatifida, pinnis infimis 10 cm longis deflexis, medialibus 20 cm longis, 7 cm latis, sessilibus, subacuminatis, rhachibus superne ferrugineo-tomentosis, inferne paleis ca. 4 mm longis linearibus plerisque curvis vel tortis linea mediale atris marginibus ferrugineis densis immersis; pinnulis sessilibus, 4 cm longis, 1 cm latis, acutis, vix ad costam pinnatifidis, costa superne ferrugineo-tomentellis, inferne nudis, segmentis 2 mm latis, contiguis,

praecipue apices versus conspicue crenato-denticulatis, papyraceis, obscuris vel inferne pallidioribus, venis conspicuis, ca. 7-paribus, plerisque furcatis; soris costularibus ad venas infimas restrictis, ideo ad basin segmenti cujusque geminatis, rarius biparibus, parvis, indusio symmetrice truncato persistente.

DUTCH NEW GUINEA: Lake Habbema, altitude 3,225 meters, *Brass* No. 9488. "Occasional in forests of moist hollows; stem branching from near base; fronds spreading; material from branch with 9 fronds."

Remarkable for the dense coat of slender paleæ, brown or dark brown in mass as the color of the margins predominates on the minor axes but not on the stipe, the naked costæ, and the minute sori strictly basal on the segments, against the costa of the pinnule. Not evidently near any other known species.

8. *CYATHEA GELUENSIS* Ros.

C. geluensis Ros., Fedde's Repert. 5 (1908) 371.

Mt. Gelu, altitude 1,000 meters, *Werner* (1907) 80, isotype in Herb. Univ. Calif. The stipe and lower part of the type plant are unknown. Our specimen is the apical 25 cm, and a pair of pinnæ from somewhat lower. These show that the entire frond was small. Subsequently described is var. *tomentosa*,³ from Sattelberg, altitude 1,400 to 1,500 meters, *Keysser* 178; of this we have two isotypes, as it was distributed under another label as *Fil. Novoguin. exsic n. 202*. We have also *Keysser* 178a, labelled var. *subpaleacea*, apparently never published. If var. *tomentosa* is *C. geluensis*, it is a widely variable species.

Suspecting that this is so, I refer to it *Brass* 12919 and 13345, Idenburg River, altitude 1,200 and 850 meters. These are excellent specimens of a much larger plant than the original. Trunk (*Brass*'s notes) 2.8 m and 7-8 m tall, 6-7 cm in diameter; stipe short, about 10 cm; the lower pinnæ gradually reduced, even to 4 cm long, paleæ of stipe 2.5 cm long, 2 mm wide, attenuate, stramineous; middle pinnæ 50-60 cm long, 15 cm wide, subsessile, acuminate, almost bipinnate, the lowest segments disconnected but adnate, rachis of pinna minutely strigose above, with an appressed tangled pale tomentum beneath, mixed with occasional narrowly linear paleæ 5 mm long; costæ clothed beneath with whitish scales 1-2 mm long, which, on No. 13345, almost all consist of round bullate bases and very long setæ, as on the type of *C. geluensis* except that its scales are less abundant and the distinction of base and seta is less

³ Fedde's Repert. 12 (1913) 525.

sharp. Rarely, the base of a scale is missing, and it becomes a hair, or the seta is missing and the scale is round. On No. 12919, scales reduced to hairs are numerous. The differences between these specimens and typical *C. geluensis* are in degree, in size, density of scaliness, etc.; and for the present they may best be regarded as that species, in a more perfect development than its type represents.

9. *CYATHEA NOVOGUINEENSIS* Brause.

C. novoguineensis BRAUSE, Engler's Jahrb. 49 (1912) 12, fig. 1 B.

Bismarck Mts., altitude 1,800 meters, *Schlechter 18697*, isotype in Herb. Univ. Calif. Not again reported.

10. *CYATHEA SEPIKENSIS* Brause.

C. sepiensis BRAUSE, Engler's Jahrb. 56 (1920) 54.

Sepik region, altitude 2,070 meters, *Ledermann 11751*. Not seen; but I have *Carr 14432*, from Boridi, altitude 4,700 feet, bearing this name; it is within the range of variation which I ascribe to *C. geluensis*.

11. *CYATHEA RIGENS* Ros.

C. rigens ROS., Fedde's Repert. 12 (1913) 163.

Bolan Mts., altitude 2,400 to 3,000 meters, *Keysser (1912) B. 79*, isotype in Herb. Univ. Calif. Not again reported.

12. *CYATHEA EVERTA* Copeland. Plate 2.

C. everta COPELAND, U. C. Publ. Bot. 18 (1942) 218.

C. rigenti subsimilis, rhachibus pinnarum squamis pluribus costis pinnularum paucioribus vestitis distincta; trunco typi teste Brassio, 5 m alto; stipite 20 cm longo, basi trunco appresso, sursum evertito horizontale, basi paleis 2 cm longis basi brunneo 2 mm latis primo nigro-ciliatis denique erosio apice nigrescentibus attenuatis vestito, sursum pallide furfuraceo vel glabrescente, aculeato; lamina 90 cm longa, acuminata, rhachi superne fusco-tomentosa, inferne pallide furfuracea; pinnis infimis fere 15 cm longis vix deflexis, medialibus 30 cm longis, 7-10 cm latis, imbricatis, sessilibus, acuminatis, vix bipinnatis, rhachibus superne fusco-tomentosis, inferne pilis squamulisque amorphis pallidis tenuiter furfuraceis et paleis nonnullis angustissimis sparsis; pinnulis 4 cm longis 1 cm latis, sessilibus vel infimis brevi-pedicellatis, acutis, costis superne tenuiter fusco-tomentosis, inferne squamulis minutis amorphis et majoribus 1-2 mm longis ovatis acuminatis stramineis sparsis; segmentis basi 3 mm alibi 2 mm latis, subfalcatis, obtusis, ubique vel apice tan-

tum denticulatis, superne atro-viridibus, inferne pallidioribus, firme papyraceis, costulis inter soros squamuliferis alibi nudis; venis ca. 8-paribus, plerisque furcatis, inconspicuis; soris costularibus, 3-6-paribus, indusiis ruptis calyce plus minus irregulare persistente.

DUTCH NEW GUINEA: 9 kilometers northeast of Lake Habema, altitude 2,800 meters, *Brass* No. 10712, type. "Common in mossy forest of slopes; slender tree fern; leaves 5 or 6, flat-spreading, 120-140 cm long;" also, Bele River, altitude 2,300 meters, No. 11415, occasional in moist hollows in Fagaceæ-forest, 2 m tall.

Much like *C. rigens*, but the tomentum darker, the secondary rachises more scaly, the costæ and costules less so. No. 11415 has a dwarfed pinna growing out of the mass of basal paleæ.

13. *CYATHEA FOERSTERI* Ros.

C. Foersteri Ros., Fedde's Repert. 10 (1912) 321.

Sattelberg, altitude 1,600 meters, *Keysser* (1911) 16, not seen. Particularly characterized by mixed pale paleæ on costæ and costulæ, the larger ones dark-ciliate, the smaller ones with dark setæ on back and margin. *Brass* 4971, Mt. Tafa, altitude 2,400 meters, is identified by Christensen⁴ as this species. It is tri-pinnate, with several pairs of secondary pinnules at the base of the primary, and is sparsely, instead of densely, scaly; but it does have the dark bristles on the sparse paleæ. Such paleæ occur also on *C. macrophylla* and *C. Archboldii*, and the larger paleæ of *C. everta* bear a few dark bristles.

14. *CYATHEA CININNATA* Brause.

C. cinninata BRAUSE, Engler's Jahrb. 56 (1920) 52.

Sepik region, altitude 1,300 meters, *Ledermann* 11200, 11279. Not seen.

Species 6 to 14 belong to a natural group, to which a number of the following show evidences of affinity.

15. *CYATHEA PROCERA* Brause.

C. procera BRAUSE, Engler's Jahrb. 56 (1920) 50.

Sepik region, altitude 2,070 meters, *Ledermann* 11856, 11879, not seen. Said to be near *C. Foersteri*.

16. *CYATHEA ALBIDOSQUAMATA* Ros.

C. albidosquamata Ros., Fedde's Repert. 12 (1913) 525.

Sattelberg, altitude 1,400 to 1,500 meters, *Keysser* (1913) 177, isotype in Herb. Univ. Calif.

⁴ Brittonia 2 (1937) 279.

17. *CYATHEA MUELLERI* Baker.

C. Muelleri BAKER, Jour. Bot. 28 (1890) 104.

Type from Mt. Knutsford, *Macgregor*.

Because the description does not show why this may not be done, I refer to this species *Brass* 9423 and 9430 and *Brass & Myer-Drees* 10023, all from about Mt. Wilhelmina, altitude 3,200 to 3,650 meters. Trunk 3–4 m tall, 20 cm thick, bearing many fronds; stipe 10–25 cm long, densely immersed in narrowly linear-aculeate shiny castaneous paleæ 7 cm long; lamina 75 cm long, 35 cm wide, freely tripinnate, naked except on the back of the minor rachises; rachis brown, slightly muriculate in the lower part, with conspicuous “glands” beside the bases of the pinnæ; pinnæ 25 cm long, 6 cm wide, short-stalked, imbricate, lower pinnæ reduced; primary pinnules 6 cm long, 16 mm wide, stalked, acute; secondary pinnules 10 mm long, 2.5–3 mm wide, apex rounded, the lower ones incised hardly half-way to the costa and the lobes emarginate, black green above (dried), brownish beneath, coriaceous, flat or somewhat bullate where freely soriferous; sori up to 5 pairs, costal, indusium firm, breaking into coarse pieces. Imbricate throughout, the denseness giving it a coarse appearance in spite of its moderate size. Remarkable also for the mass of dark, shining, needlelike basal paleæ, and for its nakedness elsewhere.

17a. *CYATHEA CRENULATA* Blume.

Cyathea crenulata Blume is not reported from New Guinea, but we have *Schlechter* 16949, Kani Mts., altitude 1,000 meters, so named. The specimen is not complete but seems to be correctly identified.

18. *CYATHEA ARCHBOLDII* C. Chr.

C. Archboldii C. CHR., Brittonia 2 (1937) 278.

Central Division: Murray Pass, altitude 2,840 meters, *Brass* 4551.

Remarkable for the abundance of brown-black setulæ on lighter-brown squamules.

19. *CYATHEA BIDENTATA* Copeland. Plate 3.

C. bidentata COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Trunco teste Brassio 3.5 m alto, 7 cm crasso; stipitis parte missa 35 cm longa, 15 mm crassa, paleis ochroleucis deorsum 3 cm longis basi (palearum) 4 mm latis deinde attenuatis apice filiformibus sursum minoribus integris ubique dense immersa; lamina abrupte acuminata, rhachi infra paleas densas castaneas

1 cm longas anguste lineares margine pallidiores erosas furfuracea; pinna mediale ca. 60 cm longa, 15 cm lata, sessile, patente, rhachi frondis simile, paleis decrescentibus dense vestita; pinnulisⁱ 8 cm longis, 1.5 cm latis, sessilibus, apice acuminatis, alibi pinnatis, costis superne minute strigosis inferne paleis lanceolatis castaneis 1–2 mm longis dense vestitis; pinnulisⁱⁱ contiguis non confluentibus, 3 mm latis, obtusis, ca. $\frac{1}{2}$ ad costam incis, lobis apice (fissis) bidentatis, superne atrofuscescentibus, coriaceis glabris; soris costalibus, indusiis fuscis persistentibus.

DUTCH NEW GUINEA: 9 kilometers northeast of Lake Habbema, altitude 2,750 meters, *Brass No. 10971*. "Frequent in forest of lower slopes; stem slender . . .; leaves 10, curved and spreading, 2.5 m long including stipes of 0.5 m; bases of stipes not persistent."

Unlike any other species known to me, in scaliness and in dissection.

20. *CYATHEA GLOBOSORA* Copeland. Plate 4.

C. globosora COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Arbor sciadomorpha, trunco teste Brassio 7–8 m alto, 5–6 cm crasso; stipite 40 cm longo, basi vix 1 cm crasso, basi imo paleis 2 cm longis 1.5 mm latis linea mediale nigris stramineo-marginatis, paleis sequentibus 3 mm latis stramineis supra mediam longitudinem fusco-costulatis apicibus setaceis fuscis, sursum paleis sparsioribus omnino stramineis vestito, superne late sulcato fusco-tomentoso, inferne spinis deorsum 1.5 mm longis sparsis sursum decrescentibus munito; lamina abrupte acuminata, rhachi deorsum 6 mm crassa, superne purpureo-fusco-tomentosa, sulcato, lateribus paleis stramineis ornata, inferne fulvo, fulvo-furfuracea; pinnis infimis 15 cm longis breviter (1 cm) stipitulatis, deflexis, medialibus late patentibus, 35 cm longis, 12 cm latis, breviter acuminatis, bipinnatis, rhachibus inferne paleis stramineis usque ad 7 mm longis persparsis ornatis aliter pallide furfuraceis; pinnulisⁱ 6.5 cm longis, 12 mm latis, sessilibus, caudato-acuminatis, rhachillis inferne deorsum paleis 1–2 mm longis sparsis, minute furfuraceis; pinnulisⁱⁱ 2.5–3 mm latis, oblique subacutis, crenulatis, coriaceis, superne atroviridibus, inferne brunnescenti-viridibus, glabris, venis plerisque furcatis; soris 4–6-paribus, indusiis globosis, brunneis, persistentibus.

DUTCH NEW GUINEA: 9 kilometers northeast of Lake Habbema, altitude 2,750 meters, *Brass No. 1077*. "Plentiful in for-

ests of slopes; slender tree-fern . . .; leaves flat-spreading, 120–150 m long.”

An exceptionally slender tree-fern, notable also for the extension of pale paleæ to the minor axes, and for the dark middle-lines complete or only distal, on the basal paleæ. *Cyathea everta* has basal paleæ in part similar.

21. *CYATHEA PACHYRRHACHIS* Copeland. Plate 5.

C. pachyrrhachis COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Arbor, trunco teste Brassio 7 m alto, 7.5 cm crasso; stipite 40 cm longo, sicco fere 2 cm crasso, purpureo-fusco, dense muriculato, superne ad latera sulcæ paleis stramineis 1.5 cm longis lineari-acicularibus deciduis vestito; fronde grande, apice abrupte acuminata, rhachibus stipiti conformibus; pinnis infimis 20–25 cm longis, deflexis, stipitulis 5 cm longis, medialibus subsessilibus, 60 cm longis, 18 cm latis, acuminatis, bipinnatis; pinnulisⁱ 9.5 cm longis, 15 mm latis, sessilibus, acuminatis, rhachillis superne tomentosis, inferne paleis 2–3 mm longis lanceolatis castaneis maximis pallidius marginatis dense vestitis; pinnulisⁱⁱ 3 mm latis, obtusis, inciso-crenatis vel inciso-dentatis, superne nigrescentibus inferne brunneo-viridibus, coriaceis, costulis deorsum squamulatis aliter glabris, venis furcatis; soris plerisque 5-paribus, contiguis, indusiis brunneis, globosis, mox fissis, deinde persistentibus.

DUTCH NEW GUINEA: 15 kilometers southwest of Bernhard Camp, Idenburg River, altitude 1,800 meters, *Brass No. 12118*. “Open situation in a forested gulley . . .; leaves 10, spreading, stipes not persistent, scars oval.”

Notable for stout stipe and rachis densely beset with minute blunt points, which indicate that it is densely paleate in veneration; but remarkable few paleæ persist, even at the base.

22. *CYATHEA PERCRASSA* C. Chr.

C. percrassa C. CHR., Brittonia 2 (1937) 279.

Mt. Albert Edward, altitude 3,500 meters, *Brass 4375*. Well characterized by “its extremely coriaceous texture and by the under side of the pinnae being densely covered with an appressed tomentum consisting of small fimbriate rufous scales with atropurpureous setæ.” Related to *C. Foersteri*.

23. *CYATHEA AURICULIFERA* Copeland.

C. auriculifera COPEL., Phil. Jour. Sci. 6 (1911) Bot. 364.

Goodenough Bay, altitude 1,200 meters, *King 227*. The type is at present out of reach, on loan.

24. *CYATHEA MACROPHYLLA* Domin.

C. macrophylla DOMIN, Acta Bot. Bohem. 9 (1930) 133.

Hemitelia Ledermanni BRAUSE, Engler's Jahrb. 56 (1920) 60.

Sepik region, altitude 1,400 to 1,500 meters, *Ledermann 12533, 12925b*; Tsuarafa, altitude 4,500 feet, *Carr 15329*, det. Alston. Near *C. auriculifera*, but larger, and distinct in several details.

25. *CYATHEA QUADRIPINNATIFIDA* Copeland. Plate 6.

C. quadripiinnatifida COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Arbor, trunco teste Brassio 2 m alto, 7.5 cm crasso, fronde stipite (1.1 m) incluso 6 m longa; stipite sicco 1.5 cm crasso, deorsum paleis 4 cm longis anguste linearibus albis nitentibus integris densis immerso, alibi fulvo-furfuraceo, spinis paucis parvis armato; lamina acuminata, rhachibus inferne furfuraceis sat dense spinosis; pinna mediale 1 m longa, 28 cm lata, stipitulo 2 cm longo; pinnulisⁱ non contiguis, breviter stipitulatis, horizontalibus, 14 cm longis, 2.4 cm latis, acuminatis, deorsum profunde bipinnatifidis, rhachilla superne tomentosa, inferne squamulis amorphis furfuracea et paleis 1 mm longis ovatis setaceis peltatis pallide marginatis linea mediale et acumine castaneis castaneo-ciliatis vestita; pinnulisⁱⁱ brevissime stipitulatis, superioribus 3 mm latis obtusis crenatis, inferioribus 5 mm latis deorsum fere ad costam pinnatifidis, coriaceis, utraque facie bruneo-viridibus, costis superne glabris, inferne squamulis parvis imbricatis ovatis castaneis pallidius marginatis apice atrocastaneo-ciliatis vestitis, segmentis 1 mm latis obtusis; pinnulisⁱⁱ fertilibus gracilioribus, inferioribus basi auriculatis alibi tantum crenatis; soris ca. 8-paribus, costalibus, contiguis, indusiis tenuibus sed persistentibus.

DUTCH NEW GUINEA: 15 kilometers southwest of Bernhard Camp, Idenburg River, altitude 175 meters, *Brass No. 12225*. "Rather open slopes of a rain-forest ravine. Tree fern with exceptionally long leaves."

Remarkable also for the dissection of the fronds. The rachises seem to be more spinose than the stipe.

26. *CYATHEA MARGINATA* (Brause) Domin.

C. marginata (Brause) DOMIN, Acta Bot. Bohem. 9 (1930) 134.

Alsophila marginata BRAUSE, Engler's Jahrb. 56 (1920) 63.

Sepik region, altitude 1,400 to 1,500 meters, *Ledermann 12586*. Not seen; "Steht keiner anderen Art nahe."

27. *CYATHEA RUBIGINOSA* (Brause) Domin.*C. rubiginosa* (Brause) DOMIN, op. cit., p. 154.*Alsophila rubiginosa* BRAUSE, Engler's Jahrb. 56 (1920) 66.

Sepik region, altitude 1,400 to 1,500 meters, *Ledermann 12539*.
Not seen.

28. *CYATHEA ALBIDULA* Domin.*C. albidula* DOMIN, op. cit., p. 89.*Alsophila hunsteiniana* BRAUSE, Engler's Jahrb. 56 (1920) 65.

Sepik region, altitude 1,350 meters, *Ledermann 11099, 11072, 11198*. Not seen.

29. *CYATHEA MACGILLIVRAYI* (Baker) Domin.*C. Macgillivrayi* (Baker) DOMIN, Pterid. (1929) 263.*Alsophila Macgillivrayi* BAKER, Syn. Fil. (1874) 458.

Louisiade Archipelago, *Macgillivray*. Not seen.

30. *CYATHEA GEPPIANA* Domin.*C. geppiana* DOMIN, Acta Bot. Bohem. 9 (1930) 118.*Alsophila straminea* GEPP in Gibbs, Dutch N. W. New Guinea (1917) 192.

Humboldt Bay, altitude 500 feet, *Gibbs 6256*. Not seen.

31. *CYATHEA WILKESIANA* Domin.*C. wilkesiana* DOMIN, Acta Bot. Bohem. 9 (1930) 171.*Alsophila samoensis* BRACK., U. S. Expl. Exped. 16 (1854) 287, pl. 40, fig. 1.

Louisiade Archipelago, *Macgillivray*, fide Baker,⁵—"I have seen no authentic specimen of this; but some of my specimens from the Louisiade sufficiently accord with the description and figure."

32. *CYATHEA SCABERULA* (Christ) Domin.*C. scaberula* (Christ) DOMIN, Pterid. (1929) 263.*Alsophila scaberula* CHRIST in Schum. & Laut., Fl. deut. Schutzgeb. (1901) 110. Not seen.33. *ALSOPHILA ARFAKENSIS* Gepp.*Alsophila arfakensis* GEPP. in Gibbs, Dutch N. W. New Guinea (1917) 70.

Arfak Mts., altitude 7,000 to 8,500 feet, *Gibbs 5990*. Not seen.

34. *CYATHEA ORDINATA* Copel. nom. nov.*Alsophila tomentosa* Hooker var. *novo-guineensis* ROS., Fedde's Rept. 5 (1908) 34.⁵ Syn. Fil. (1874) 39.

Mt. Gelu, altitude 1,700 meters, *Werner* (1907) 71. Isotype in Herb. Univ. Calif.

Too different from *C. tomentosa* (Blume) Zoll. to be regarded as a variety; moreover, not, in my opinion, very intimately related to that species. It is nowhere quite tripinnate; the secondary rachises are less spinulose; the costæ of the pinnules are more scaly, and bear near their bases conspicuous pale lanceolate paleæ of a type wanting on the Java plant. It is more nearly related to *C. magna*. *Brass* 4063 and 4966, Mt. Tafa, altitude 2,400 meters, match the isotype perfectly. The base of the stipe is immersed in pale scales 1–3 cm long, some of them fuscous-tipped.

35. *CYATHEA MAGNA* Copeland. Plate 7.

Cyathea magna COPELAND, U. C. Publ. Bot. 18 (1942) 218.

Arbor, trunco teste *Brassio* 8 m alto, 25 cm crasso; stipite 80–90 cm longo, 1.5 cm crasso, purpureo-fusco, spinis 4 mm altis paleas lanceolatas fuscas 1 cm longas ferentibus horrido; lamina teste *Brassio* fere 3 m longa, rhachi laete castanea, spinis minoribus horridula, paleis aurantiacis ciliatis deciduis vestita, sparse furfuracea; pinna maxima 85 cm longa, 25 cm lata, brevipedicellata, profunde bipinnatifida; rhachi superne sulcata pilis minutis nigris et crinitis et rectis vestita, inferne et lateraliter verrucosa furfuracea tum demum glabrescente; pinnulis sessilibus, 14 cm longis, fere 2 cm latis, brevi-acuminatis, coriaceis, costa superne pilis minutis deorsum plerisque fuscis sursum cinereis, inferne paleis variis ciliatis,—et deorsum castaneis lanceolatis et ubique cinereis laceris, et squamulis amorphis,—vestita; segmentis contiguis, 8 mm longis 3 mm latis, rotundatis, obscure denticulatis, margine modo deflexis, superne atroviridibus glabrescentibus, inferne costula squamulis laceris pallidis onusta, alibi pilis albidis brevibus sparsis; soris usque ad 13-paribus, constularibus, indusiis carentibus.

DUTCH NEW GUINEA: Bele River, altitude 2,250 meters, *Brass* No. 11278. "Fagaceous forest; plentiful on very steep slope. . .; interrupted white line on sides of stipe and rachis,"—this not visible in the herbarium.

A relative of *C. atrox* and *C. ordinata*, much more ample than either, with few dark basal paleæ instead of the pale ones of the latter and many dark ones of the former, the pinnules much more scaly than those of *C. atrox*.

36. *CYATHEA HORRIDULA* Copeland. Plate 8.

Cyathea horridula COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor, trunco teste Brassio 3 m alto gracile; stipite 40 cm longo, 8 mm crasso, deorsum paleis deciduis stramineis 1.5 cm longis 1 mm latis apice minute obscure ciliatis vestito, ubique spinulis 0.5–1.0 mm longis muricato, sparse sordide furfuraceo; lamina speciminis imperfecta, apice 20 cm longa bipinnatifida acuminata; rhachi brunnea minutissime muriculata; pinna infima arcte recurva 25 cm longa 8 cm lata breviter (8 mm) pedicellata; pinna mediale 45 cm longa, 10–11 cm lata, acuminata, subsessile, vix bipinnata, rhachi superne atro-fusco-tomentosa, inferne squamulis minutis bullatis et amorphis aliisque paucis filiformibus 3 mm longis sparse vestita; pinnulis contiguis, sessilibus, 5.5 cm longis 13 mm latis, acutis, profunde pinnatifidis; segmentis paucis infimis adnatis non confluentibus, papyraceis, superne obscuris costis sparse tomentellis aliter glabris, inferne pallidioribus costis deorsum paleis stramineis 2–5 mm longis basi 1 mm latis deinde contractis cum squamulis bullatis et amorphis intermedialibusque mixtis vestitis; segmentis 3 mm latis, oblique obtusis, apice denticulatis alibi subserrulatis, costulis inferne squamulis paucis deciduis sparsis; pinnulis fertilibus paullo contractis, soris costularibus, indusiis nullis.

DUTCH NEW GUINEA: 15 kilometers southwest of Bernhard Camp, Idenburg River, altitude 1,700 meters, *Brass* No. 12043, in undergrowth of rain-forest gulley.

A rather characterless species, with conspicuous paleæ on the basal half of the costæ and nowhere else, with only a few remaining on the rather densely short-muricate stipe.

37. *CYATHEA SCABRISETA* Copeland.

* *C. scabriseta* COPEL., Phil. Jour. Sci. 9 (1914) Bot. 2.

Papua, type locality unknown, *King* 444; Lower Mori River, *Brass* 1570.

38. *CYATHEA BRASSII* Copeland.

C. Brassii COPEL., Jour. Arnold Arb. 10 (1929) 175.

Eastern Division: Aisa River, *Brass* 1421. Possibly not distinct from *C. scabriseta*.

39. *CYATHEA SCABERULIPES* (v. A. v. R.) Domin.

C. scaberulipes (v. A. v. R.) DOMIN, Acta Bot. Bohem. 9 (1930) 174.
Alsophila scaberulipes v. A. v. R., Nova Guinea 14 (1924) 2.

DUTCH NEW GUINEA: Prauwenbivak, altitude 60 to 90 meters, *Lam* 868, isotype in Herb. Univ. Calif. I have very nearly the same plant from the Solomon Islands, *Brass* 3124. Var. *ciliolata* v. A. v. R.⁶ is a more robust individual, also represented by isotype in Herb. Univ. Calif.

40. *CYATHEA PILULIFERA* Copeland. Plate 9.

Cyathea pilulifera COPELAND, U. C. Publ. Bot. 18 (1942) 219.

C. contaminanti affinis, rhachi brunneo-purpurea, fronde minore, et venulis inferne pilis minutis multis ornatis diversa; trunco breve; stipite 50 cm longo, paleis stramineo-albis flaccidis 1–1.5 cm longis lanceolatis attenuatis setis deciduis pallidis et obscuris ciliatis per mediam longitudinem (stipitis) vestito, spinis 3–5 mm longis acutis densis munito, sursum rhachique glabrescentibus purpurascentibus spinis minoribus aculeatis; lamina ut videtur vix 1 m longa, abrupte acuminata, basi truncata, vix tripinnata, rhachibus superne atro-fusco-tomentosis; pinna infima recurva longius (6 cm) pedicellata, 16 cm longa 14 cm lata; pinna sequente maxima, brevius (2 cm) pedicellata, 32 cm longa vix 14 cm lata, acuminata, pinnulis 7 cm longis, 12 mm latis, acuminatis, plerisque sessilibus, profunde sed nullibi ad costam pinnatifidis, superne fusco-viridibus, inferne olivaceis, costis glabrescentibus; segmentis contiguus, 2.5 mm latis, falcato-obtusis, coriaceis, costulis deorsum squamulis minutis stramineis bullatis ornatis, sursum venisque pilis multis albidis minutis vestitis; soris in framedialibus, parvis, indusiis carentibus.

DUTCH NEW GUINEA: Bele River, altitude 2,200 meters (?), *Brass* No. 11492. "Very abundant in young second-growth forest, in old garden lands, and often preceding woody growths after the weed stage; stem very short or obsolete; fronds spreading, glaucous underneath:" in the herbarium, they are somewhat pale, but not glaucous.

"*Alsophila glauca* var. *squamulata*" Ros. has larger hairs as well as scales on the costulae. It is much larger, tripinnate, its rachises brown, not reddish. *Cyathea aeneifolia* has deciduously short-hairy veins.

40a. *CYATHEA SAPARUENSIS* v. A. v. R.

Cyathea saparuensis v. A. v. R.—*Alsophila saparuensis* v. A. v. R.⁷—is reported from Dutch New Guinea by Ridley. It is an

⁶ Nova Guinea 14 (1924) 2.

⁷ Bull. Dept. Agric. Ind. Neerl. 18 (1908) 2.

imperfectly known species, doubtfully represented by a living plant in Buitenzorg.

41. *CYATHEA AENEIFOLIA* (v. A. v. R.) Domin.

C. aeneifolia (v. A. v. R.) DOMIN, Acta Bot. Bohem. 9 (1930) 174.

Alsophila aeneifolia v. A. v. R., Nova Guinea 14 (1924) 3.

Doorman-top, altitude 3,240 meters, *Lam 1751*. Not seen.

Var. *subglauca* v. A. v. R.,⁸ *Lam 1805*, is a larger plant, with smaller spines and smaller pinnules.

42. *CYATHEA GREGARIA* (Brause) Domin.

C. gregaria (Brause) DOMIN, op. cit., p. 120.

Alsophila gregaria BRAUSE, Engler's Jahrb. 56 (1920) 68.

Sepik region, altitude 2,070 meters, *Ledermann 11627, 12056*. Not seen.

43. *CYATHEA TENUICAULIS* Domin.

C. tenuicaulis DOMIN, op. cit., p. 165.

Alsophila tenuis BRAUSE, Enger's Jahrb. 56 (1920) 71.

Sepik region, altitude 300 to 400 meters, *Ledermann 7498*. Not seen; but I have *Carr 13363* and *14542*, from Boridi, altitude 5,000 feet, determined by Alston, probably by comparison with the type. They are not nearly related to *C. contaminans*.

44. *CYATHEA BRAUSEANA* Domin.

C. brauseana DOMIN, Pterid. (1929) 262.

Alsophila Hieronymi BRAUSE, Engler's Jahrb. 49 (1912) 14.

Kani Mts., altitude 600 meters, *Schlechter 17635*. Not seen. "Ist eine für sich allein stehende Art ohne Annäherung an andere bekannte Formen."

45. *CYATHEA WENGIENSIS* (Brause) Domin.

C. wengiensis (Brause) DOMIN, Pterid. (1929) 263.

Alsophila wengiensis BRAUSE, Engler's Jahrb. 49 (1912) 13, fig. 1 C.

KAISER-WILHELMSLAND: Near Wengi, altitude 500 meters, *Schlechter 16100*; isotype in Herb. Univ. Calif. Well characterized by the many small median sori, forming a row around each segment, wanting near the costa.

46. *CYATHEA DIELSII* (Brause) Domin.

C. Dielsii (Brause) DOMIN, Acta Bot. Bohem. 9 (1930) 111.

Alsophila Dielsii BRAUSE, Engler's Jahrb. 56 (1920) 67.

Sepik region, altitude 2,070 meters, *Ledermann 11627, 12056*. Not seen; but, judging by description, *Brass 4549*, Murray Pass, altitude 2,840 meters, may well be this species.

⁸ Ibid.

47. *CYATHEA MELANACANTHA* Copeland. Plate 10.

Cyathea melanacantha COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Alsophila gregis C. contaminantis; trunco teste Brassio 1.5 m alto; stipite 60 cm longo, basi 3 cm sursum 7 mm crasso, paleis 1 cm longis angustis brevi-aciculatis breviter et decidue ciliatis atrocastaneis nitidis deorsum dense sursum sparse vestito, spinis nigris validis acutis deorsum 6 mm longis sursum minoribus perhorrido; fronde speciminis imperfecta, verosimiliter 1.5 m longa, abrupte acuminata, vix tripinnata, rhachi fulvo-fusca, spinulosa, minute furfuracea, ad pedes pinnarum paleis stramineis integris angustis 1 cm longis ornata (iisdem alibi verosimiliter dejectis); pinna mediale 40 cm longa 16 cm lata, abrupte acuminata, breviter (12 mm) pedicellata, rhachi muricata minute furfuracea; pinnulis sessilibus, 9 cm longis, 16 mm latis, acutis, inferioribus ad basin tantum pinnatis alibi fere ad costas pinnatifidis, costis superne setuliferis, inferne paleis minutis stramineis et bullatis apiculatis et lanceolatis planis et filiformibus vestitis; segmentis coriaceis, subfalcatis, obtusis, obscure serrulatis, superne atroviridibus subnudis, inferne subglaucis, squamulis variis pallidis ca. 0.5 mm longis ubique sat dense ornatis; soris ca. 8-paribus, contiguis, fulvis, indusiis omnino carentibus.

DUTCH NEW GUINEA: Lake Habbema, altitude 3,225 meters, Brass No. 9311. "Occasional in forest edges; fronds few, glaucous beneath, lower and medial pinnae curved back towards stipes."

Forms referred to *C. contaminans* as varieties bear a variety of squamules and hairs on the veins, none as copiously as this species. The sharply diagnostic character is the mass of short brownish-black paleæ on the lower part of the stipe; on *C. contaminans*, these are pale, and longer. King 215, from British Papua, in open country, is an incomplete specimen, possibly of this species.

48. *CYATHEA EXTENSA* (Forster) Swartz.

Ledermann 8595, 6577, 7010, fide Brause. Long accredited to New Guinea, whence I know no specimen. The species is best known as a plant of Fiji, but that cannot be its type locality.

49. *CYATHEA INTERMEDIA* (Mett.) Copeland.

C. intermedia (Mett.) COPEL., Univ. Calif. Publ. Bot. 16 (1929) 357.
Alsophila intermedia METT., Ann. Sc. Nat. IV 15 (1861) 83.

This is a species of New Caledonia, reported from New Guinea, but not known to me there.

50. *CYATHEA ATROX* C. Chr.

C. atrox C. CHR., Brittonia 2 (1937) 275.

Lake Habbema, altitude 3,225 meters, *Brass* 9444. "Few trees in moister and denser thickets of peaty ridges; 3-5 m high, 11 cm diam.; leaves 19, about 1.5 m long, 65 cm broad, forming a spreading crown; leaves in vertical rows; stipes not appressed, not persistent." Previous collections are the type, *Brass* 4596, from Murray Pass, altitude 2,840 meters, and *Brass* 4410, from Mt. Albert Edward, altitude 3,680 meters. Characterized by dark basal paleæ, many coarse black-tipped spines on the stipe, and abundant various ferruginous paleæ beneath the frond. The Lake Habbema specimen conforms except for weak whitish paleæ on the upper side of the upper part of the stipe and lower part of the rachis; and it is not quite so spiny. The dark-chestnut basal scales are the same.

51. *CYATHEA CONTAMINANS* (Wall.) Copeland.

C. contaminans (Wall.) COPEL., Phil. Jour. Sci. 4 (1909) Bot. 60.

Alsophila glauca (Blume) J. Sm.

This is commonly construed as a most variable species. We have without a varietal name *Schlechter* 16624, the costulæ sparingly hairy beneath, segments 5 mm wide. Var. *setulosa* is represented by *Lam* 1292, Doorman River, altitude 200 meters; *Brass* 13647 Idenburg River, altitude 850 meters, is the same. *Brass* 5488, Mafulu, altitude 1,250 meters, is similar but less hairy. Var. *trichopoda* Ros.⁹ is based on *Bamler* (1914) 101 (of which our specimen, from Dr. Rosenstock, is labeled "v. *squamulata* Ros. n. v."). *Werner* (1907) 81, from Mt. Gelu, is labeled "v. *eriosora* Ros. n. v."

Equally various forms are referred to this species in other lands. Construing it thus broadly, I am unable to distinguish:

CYATHEA ARUENSIS Domin.

C. aruensis DOMIN, Pterid. (1929) 262.

Alsophila polyphlebia BAKER, Jour. Linn. Soc. 15 (1876) 104, from Aru Island.

CYATHEA NAUMANNII (Kuhn) Domin.

C. Naumannii (Kuhn) DOMIN, Pterid. (1929) 263.

Alsophila Naumannii KUHN, Forschungsr. Gazelle 4 (1889) 13; of which, according to the labels, we have *Schlechter* 17532 and *Keysser* (1913) 173, which are not alike; and *Carr* 13217, named with doubt.

⁹ Hedw. 56 (1915) 349.

CYATHEA CURVIPINNULA C. Chr.

C. curvipinnula C. CHR., Brittonia 2 (1937) 276.

It is not my intent to reduce these three species, but merely to state that they do not appear to be more distinct than the forms elsewhere treated as varieties of *C. contaminans*.

52. CYATHEA FUGAX v. A. v. R.

C. fugax v. A. v. R., Bull. Jard. Bot. Buit. 7 (1912) 8.

"Papua, in open country," King 215.

The indusium is fugacious indeed; but this can be distinguished from *C. contaminans* by scaliness also.

53. CYATHEA TRUNCATA (Brack.) Copeland.

C. truncata (Brack.) COPEL., Phil. Jour. Sci. 4 (1909) Bot 39.

Var. *nivea* CHRIST in Schum. & Laut., Fl. deut. Schutz-Geb. Nachtr. (1905) 36.

Only the variety is accredited to New Guinea; it is unknown to me, and I mistrust its specific identity with the Polynesian species.

54. CYATHEA EMINENS Domin.

C. eminens DOMIN, Pterid. (1929) 262.

Alsophila concinna BAKER, Syn. Fil. (1874) 459.

Louisiade Archipelago, Macgillivray. Not seen.

55. CYATHEA ATROPURPUREA Copeland.

C. atropurpurea COPEL., Phil. Jour. Sci. 3 (1909) 354; 4 (1909) 36, pl. 18.

This is a Philippine species. Its report from New Guinea is probably an error, originating in Christensen, Index Suppl. I (1913) 4.

56. CYATHEA ATRISPORA Domin.

C. atrispora DOMIN, Acta Bot. Bohem. 9 (1930) 95.

Alsophila dryopteroides BRAUSE, Engler's Jahrb. 56 (1920) 70.

Sepik region, altitude 2,070 meters, Ledermann 1897. In spite of Brause's confidence that he detected a complete annulus, this may still be suspected of being a *Dryopteris*.

57. CYATHEA ASCENDENS Domin.

C. ascendens DOMIN, op. cit., p. 94.

Alsophila Rosenstockii BRAUSE, Engler's Jahrb. 56 (1920) 63.

Sepik region, altitude 1,000 meters, Ledermann 9963; Etappenberg, altitude 850 meters, Ledermann 9361. Not seen. Frond not quite bipinnate. This also looks like a *Dryopteris*, but I credit Brause's assignment to "*Alsophila*."

58. *CYATHEA SCANDENS* (Brause) Domin.

C. scandens (Brause) DOMIN, op. cit., p. 156.

Alsophila scandens BRAUSE, Engler's Jahrb. 56 (1920) 77.

Sepik region, altitude 1,000 meters, *Ledermann* 9885. Related to *C. biformis*, which also is scandent.

59. *CYATHEA BIFORMIS* (Ros.) Copeland.

C. biformis (Ros.) COPEL., Phil. Jour. Sci. 6 (1911) Bot. 423.

Brass 8947, Cyclops Mountains, altitude 575 meters; 13318, 12289, Idenburg River region, altitude 900 and 1,800 meters. All scandent, as is true also of the type collection, *King* 57, from the Gira gold field. Well characterized by black and purplish-black axes, shiny, dark-brown linear paleæ on the stipe, and dimorphous fronds, the sterile pinnules serrulate to crenate, the fertile pinnules pinnate. Beyond this, variable. Nos. 8947 and 12289 are like the type in having dwarf-pinnæ at the base of the stipe, but No. 13318 is without these. No. 13318 is like the type in having conspicuous paleæ on the lower part of the rachis; Nos. 8947 and 12289 have them only at their base. The pinnules vary in shape and in nakedness; and the dimorphism is imperfect. Pinnate fronds of juvenile terrestrial plants accompany Nos. 8947 and 12289. Brause¹⁰ cites five collections by *Ledermann*.

As to *Cyathea Gibbsiae* Copel.,¹¹ *Polybotrya arfakensis* Gepp, *Thysanosoria arfakensis* v. A. v. R., I still have not seen it, nor had Brause, who reduced it to *C. biformis*. *Cyathea biformis* is more variable than I have realized in the past, and is accordingly more likely to include another variant.

60. *CYATHEA SCHLECHTERI* (Brause) Domin.

C. Schlechteri (Brause) DOMIN, Pterid. (1929) 263.

Alsophila Schlechteri BRAUSE, Engler's Jahrb. 49 (1912) 15, fig. 1 D.

Kani Mts., altitude 1,000 meters, *Schlechter* 17140. Isotype in Herb. Univ. Calif.

61. *CYATHEA DIMORPHOPHYLLA* Domin.

C. dimorphophylla DOMIN, Acta Bot. Bohem. 9 (1930) 111.

Alsophila Ledermanni BRAUSE, Engler's Jahrb. 56 (1920) 76.

Sepik region, altitude 850 meters, *Ledermann* 9275, 9568. Not seen.

62. *CYATHEA BRUNNEA* (Brause) Domin.

C. brunnea (Brause) DOMIN, op. cit., p. 101.

Alsophila brunnea BRAUSE, Engler's Jahrb. 56 (1920) 73.

¹⁰ Engler's Jahrb. 56 (1920) 74.

¹¹ Phil. Jour. Sci. 33 (1920) 129.

Sepik region, *Ledermann* 9871, altitude 1,000 meters; 12113, altitude 2,070 meters. Not seen.

63. *CYATHEA GRACILLIMA* Copeland. Plate 11.

Cyathea gracillima COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor, trunco 1.5–3 m alto, 1.5 cm crasso, sursum basibus muricatis stipitum aspero; stipite ca. 25 cm. longo, vix 5 mm crasso, basi trunco appresso, deinde patente, cinnamomeo, deorsum dense sursum sparsius spinulis asperato, basi paleis castaneis 1 cm longis basi vix 1 mm latis integris sursum denticulatis apice acicularibus vestito, alibi glabrescente; lamina 90 cm longa, 45 cm lata, acuminata, profunde tripinnatifida; rhachi deorsum spinulis paucis minutis praedita, alibi molle, superne sulcata sordide furfuracea, inferne nuda; pinnis medialibus 25 cm longis, 10 cm latis, acuminatis, pedicellatis, infimis paullo minoribus deflexis; pinnulis brevissime stipitulatis, breviter acuminatis, papyraceis, superne costis pilis minutis inflexis vestitis aliter glabris atro-viridibus, inferne pallidioribus costis et costulis squamulis minutis pallidis lanceolatis et ovatis subbullatis sparsis, sterilibus usque ad 5.5 cm longis 13 mm latis, segmentis 2.5–3 mm latis, apice rotundatis, obscure crenulatis, ala angusta confluentibus; pinnulis fertilibus paullo minoribus, segmentis angustioribus, inferne soris confluentibus omnino obtectis, indusiis nullis.

DUTCH NEW GUINEA: Bernhard Camp, Idenburg River, *Brass* No. 12824, type, altitude 1,200 meters. "Very slender tree-fern, 1.5–2 m high; bulbils frequent on stem; leaves few, flat-spreading, only one fertile. Locally common on ridges in the rain forest." No. 13489, altitude 850 meters, "plentiful on river flats; very slender tree-fern 2–3 m high."

The contraction of the fertile pinnæ is fairly conspicuous. On No. 12824, the lower part of the frond is fertile, the upper part sterile and more ample. No. 13489 has a frond fertile throughout, and similarly contracted.

64. *CYATHEA OLIVACEA* (Brause) Domin.

C. olivacea (Brause) DOMIN, Acta Bot. Bohem. 9 (1930) 143.

Alsophila olivacea BRAUSE, Engler's Jahrb. 56 (1920) 74.

Sepik region, altitude 2,070 meters, *Ledermann* 12092, 12096. Not seen.

65. *CYATHEA MELANOCLADA* Domin.

C. melanoclada DOMIN, op. cit., p. 174.

Alsophila melanocaulos v. A. v. R., Nova Guinea 14 (1924) 1.

Doorman-top, altitude 1,420 meters, *Lam* 1567; isotype in Herb. Univ. Calif.; Cyclops Mts., altitude 500 meters, *Brass* 8946;

Idenburg River, altitude 1,800 meters, *Brass* 12288; altitude 1,200 meters, *No.* 12822. The field notes on the last two collections emphasize the deciduous character of the fertile lower pinnæ.

The most similar species known to me is *C. Hornei* (Baker) Copel., of Fiji, which has stalked sterile pinnules, pinnate only at the base; *C. Schlechteri* may be still more like this. Judging by the descriptions, *C. brunnea* and *C. dimorphophylla* are nowhere quite tripinnate; the pinnules of *C. olivacea* are pinnate near the base; those of *C. melanoclada*, pinnate throughout.

66. *CYATHEA HUNSTEINIANA* Brause.

C. hunsteiniana BRAUSE, Engler's Jahrb. 56 (1920) 58.

Sepik region, altitude 1,300 meters, *Ledermann* 11139; altitude 2,070 meters, *Ledermann* 11832, and (var. *acuminata* Brause, *ibid.*) 12186; altitude 1,400 to 1,500 meters, *Ledermann* 12742. Not seen.

67. *CYATHEA LEDERMANNI* Brause.

C. Ledermanni BRAUSE, Engler's Jahrb. 56 (1920) 56.

Sepik region, altitude 200 to 400 meters, *Ledermann* 9651; Lordberg, altitude 1,000 meters, *Ledermann* 9882. Not seen; but *Brass* 13092, Idenburg River, altitude 900 meters, conforms to the description.

68. *CYATHEA MICROPHYLLOIDES* Ros.

C. microphyloides ROS., Fedde's Repert. 12 (1913) 164.

Bolan Mts., altitude 2,400 to 3,000 m, *Keysser* (1912) B. 71. Not seen.

69. *CYATHEA PERPELVIGERA* v. A. v. R.

C. perpelvigera v. A. v. R., Nova Guinea 14 (1924) 11.

Doorman-top, altitude 1,400 to 2,500 meters, *Lam* 1441; isotype in Herb. Univ. Calif.; *Lam* 1947; Idenburg River, altitude 1,800 meters, *Brass* 11896, very abundant in absence of woody undergrowth. Trunk 2.5 m high, 1.5–2 cm in diameter. Remarkable for its slender trunk and finely dissected foliage.

70. *CYATHEA PERANEMIFORMIS* C. Chr.

C. peranemiformis C. CHR., Brittonia 2 (1937) 277.

Mt. Tafa, altitude 2,400 meters, *Brass* 4990.

71. *CYATHEA PULCHERRIMA* Copeland. Plate 12.

Cyathea pulcherrima COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor gracillima, trunco teste Brassio usque ad 6 m alto, 3 cm crasso; stipite 50 cm longo, rhachique paleis castaneo-

atris setiformibus hispidis 2 cm longis dense vestitis, sursum inferne paleis plerisque dejectis dense muricatis; lamina 1 m longa, brevi-acuminata, late ovata; pinna infima 35 cm longa, subdeflexa, breviter (1 cm) pedicellata; pinna mediale subsessile, ca. 50 cm longa, 18 cm lata, tripinnatifida, rhachi setis minoribus pallescentibus sparsis vestita; pinnulisⁱ sessilibus, vix contiguus, 9.5 cm longis, 15 mm latis, acutis, rhachillis costisque et sparsissime venis setis pallidis ca. 1 mm longis vestitis; pinnulisⁱⁱ 3 mm latis, obtusis, basi ad costas pinnatis alibi profunde pinnatifidis, oblique adnatis et (infinis exceptis) decurrenti-adnatis, herbaceis, viridibus, segmentis ultimis plerisque apice late bidentatis; soris prope basin segmenti solitariis, indusio tenue persistente.

DUTCH NEW GUINEA: Idenburg River, altitude 575 meters, *Brass* No. 8940, type, "abundant in sheltered moist hollows in tall forest;" also, No. 12961, altitude 1,100 meters. "Common on crests of ridges in rain forest; stem 4.5 m high, 5 cm diam. under the leaves; fronds 7, flat-spreading, 2.9 m long including the 1 m long stipes."

In texture and dissection, much like *C. alata* (Fournier) Copel., of New Caledonia.

72. *CYATHEA LEPIDOCCLADA* (Christ) Domin.

C. lepidoclada (Christ) DOMIN, Acta Bot. Bohem. 9 (1930) 130.

Alsophila lepidoclada CHRIST in Schum. & Laut. Fl. deut. Schutzgeb. Nachtr. (1905) 37.

Brass 13357, Idenburg River, altitude 850 meters, conforms to the description except for being larger throughout. The stipe is 20 cm long; its paleæ 15 by 3–4 mm, the margin entire or erose; lamina 1.5 m long, nearly 40 cm wide; larger pinnæ 22 cm long, 3.5–4 cm wide near the base, the lowest basiscopic pinule distinctly the largest; lowest secondary pinnules dilated in the middle, contracted at the base, the others decurrent-confluent. I can find no trace of an indusium; it is evident, and (in age) smoothly truncate in *C. peranemiformis* and *C. perpelvigera*, and so described in *C. hunsteiniana*.

73. *CYATHEA PARVA* Copeland. Plate 13.

Cyathea parva COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor parva, trunco teste Brassio 1.5 m alto, apice 3.5 cm crasso; stipite 10 cm longo, basi incrassato paleis 1–1.5 cm longis basi 1 mm latis stramineis linea mediale sursum interdum castanea aciculari-extensa vestito, sursum 3 mm crasso glabrescente, minute dense muriculato; rhachi brunnea, sursum

laeve, paleis paucis linearibus usque ad 5 mm longis pallidis vix persistentibus ornata, minutissime furfuracea; lamina 55 cm longa, 32 cm lata, acuminata, vix tripinnata; pinnis infimis 6 cm longis, recurvis, pinnatis; medialibus 17 cm longis, 5 cm latis, acuminatis, subsessilibus, rhachibus superne cinnamomeo-tomentosis, inferne paleis stramineis usque ad 5 mm longis et 1 mm latis aliisque angustioribus et filiformibus vestitis; pinnulis sterilibus 6 mm fertilibus 5 mm latis, sessilibus, acutis vel obtusis, vix ad costas pinnatifidis, papyraceis, superne fusco-viridibus costis inconspicue pilulosis, inferne brunneo-viridibus costis deorsum squamulis stramineis 1.5–2 mm longis ovatis subbullatis vestitis, venulis inconspicuis simplicibus, soris 3–4-paribus, contiguis, costularibus, parvis, indusio falso squamulis nonnullis basalibus laceris constituto.

DUTCH NEW GUINEA: 15 kilometers southwest of Bernhard Camp, Idenburg River, altitude 1,750 meters, *Brass* No. 12197. "Undergrowth of a rain-forest gulley; leaves 4, 90 cm long."

Probably related to *C. lepidoclada*; the paleæ on the minor axes more suggestive of *C. albidosquamata*; peculiar in the muriculate stipe.

74. *CYATHEA KLOSSII* Ridley.

C. Klossii RIDLEY, Trans. Linn. Soc. II 9 (1916) 251.

Trail to Mt. Carstensz, altitude 1,100 to 2,500 feet. Not seen.

75. *CYATHEA PAPUANA* (Ridley) v. A. v. R.

C. papuana (Ridley) v. A. v. R., Malayan Ferns Suppl. (1917) 487.

Alsophila papuana RIDLEY, Trans. Linn. Soc. II 9 (1916) 252.

Trail to Mt. Carstensz, altitude 2,500 feet, *Boden-Kloss*; Isuarawa, altitude 5,000 feet, *Carr* 15545, 15720.

76. *CYATHEA KEYSSERI* Ros.

C. Keysseri ROS., Fedde's Repert. 12 (1913) 164.

Bolan Mts., altitude 3,400 to 3,800 meters, *Keysser* (1912) B. 32: *Clemens*, s. n., "common at 12,000 feet and above on Sarawaket,—meadow margins."

See notes under the following species.

77. *CYATHEA CHEILANTHOIDES* Copeland. Plate 14.

Cyathea cheilanthoides COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor, trunco breviusculo; stipite subnullo basique stipitis paleis 6 cm longis basi 2 mm latis aciculari-attenuatis integris rigidis vix tortis et haud crinitis castaneis nitidis pallide (ferugineo-) marginatis immersis; lamina 75 cm longa, 20 cm lata,

subacuta, tripinnata; rhachi fusca, glabrescente, deorsum aerophoris paucis leviter elevatis subrotundis praedita, aliter laeve et molle; pinnis supramedialibus maximis, 13 cm longis, 3.5 cm latis, erecto-patentibus, imbricatis, subsessilibus, abrupte acutis, basi truncatis, rhachillis purpureo-fuscis, superne paleis albidis anguste linearibus appressis vestitis, inferne glabrescentibus; pinnulisⁱ 3 cm longis, 3 mm latis, sessilibus, infimis infra rhachin deflexis caeteris plerisque erecto-patentibus, rhachillis superne nudis, inferne squamulis paucis pallidis deciduis praeditis; pinnulisⁱⁱ bullatis vel cucullatis, plerisque semi-globosis, inferioribus triangulari-oblongis, coriaceis, superne glabris fuscis, inferne squamulas paucas pallidas fibrillasque includentibus; soris ad pinnulam quamque orbicularem plerumque 2 vel 3, ad pinnulas longiores usque ad 5, indusio brunneo persistente; pinnis inferioribus minoribus, subremotis, etenim e paleis basalibus emergentibus, 6 cm longis, pinnulisⁱⁱ cucullatis sterilibus.

DUTCH NEW GUINEA: Lake Habbema, altitude 3,225 meters, *Brass No. 9283*. "Associated with low shrubs on well drained grassy ridges; gregarious; very striking feature of vegetation, 1 to over 3 m high; material from old plant, stem 1 m high, 17 cm diam. at base, 24 cm diam. under crown; fronds 29, glaucous beneath, rachis glaucous."

This is another species of the group of *C. Macgregori*, *C. Keysseri* and *C. gleichenioides*. *Cyathea imbricata* is only approximately one of this group, having merely convex segments instead of strongly bullate secondary pinnules, and broad, dark, shorter basal paleæ, which do not form a dense mass. I have complete frond of *C. Macgregori*, det. C. Chr., *C. gleichenioides* and *C. imbricata*, isotypes, and the upper part of an isotype of *C. Keysseri*; such material of *Cyathea* is a luxury. As to form and dissection of the frond of *C. Keysseri*, I depend upon the description; our specimen does not show them, and they are apparently distinctive features; the *costis primariis . . . asperulis* are also diagnostic, and conspicuous. *Cyathea cheilanthoides* is by far the most naked of the four, distinguished further by the absence of any stipe above the pinnæ at the very base, and by the stiffer, straighter, pale-marginate basal paleæ. The paleæ of *C. Macgregori* are softer and much twisted, those of *C. gleichenioides* still softer and almost crinite, and both are practically nonmarginate. Both of these have more reduced basal pinnæ (Christensen is in error as to *C. Macgregori*, and it is probably

not constant), with some stipe above them, below the pinnæ of the lamina proper.

78. *CYATHEA MACGREGORI* F. v. Mueller.

C. Macgregori F. v. MUELLER [Tr. Royal Soc. Victoria 1 (1889) 40] Jour. of Bot. 28 (1890) 104; CHRISTENSEN, Brittonia 2 (1937) 280.

Mt. Knutsford, *MacGregor*; Mt. Albert Edward, altitude 3,680 m, *Brass* 4285, 4351. Known to me by Brass's collections, fully described by Christensen. Reported also from the trail to Mt. Carstensz, altitude 3,900 feet, by Ridley.

79. *CYATHEA GLEICHENIOIDES* C. Chr.

C. gleichenioides C. CHR., Brittonia 2 (1937) 281.

Murray Pass, altitude 2,840 m, *Brass* 4595; Mt. Albert Edward, altitude 3,680 m, *Brass* 4265.

80. *CYATHEA IMBRICATA* v. A. v. R.

C. imbricata v. A. v. R., Nova Guinea 14 (1924) 11.

Doorman-top, altitude 3,250 m, *Lam* 1622, isotype in Herb. Univ. Calif.; 1729.

81. *CYATHEA ARFAKENSIS* Gepp.

C. arfakensis GEPP in Gibbs, Dutch New Guinea (1917) 69.

Angi Lakes, altitude 8,000 feet, *Gibbs* 6008. Not seen.

82. *CYATHEA TOMENTOSISSIMA* Copeland. Plate 15.

Cyathea tomentosissima COPELAND, U. C. Publ. Bot. 18 (1942) 219.

Arbor, trunco crasso; stipite 30 cm longo, (sicco) 5 mm crasso, basi paleis castaneis nitidis 5 cm longis basi 1 mm latis tortis dense immerso, sursum sub indumento denso fulvo pilorum squamarumque minutarum lacerarum et ciliatarum intertextarum etiam cum paleis albis linearibus 1-2.5 cm longis subintegris et ciliatis mixto brunneo; lamina 35-70 cm longa, 20 cm lata, subacuta, basi modo angustata, subtripinnata, rhachibus ut stipite tomentosis et paleatis paleis sursum minoribus et sparsioribus; pinnis infimis 5-8 cm, medialibus 14 cm longis, 5 cm latis, acutis, subsessilibus basi obliquis; pinnulis¹ majoribus 3 cm longis, 7 mm latis, acutis, sessilibus, rhachillis superne pilis et squamulis amorphis crinitis albis non densis ornatis, inferne squamis dissectis stramineis dense occultis; pinnulis² 3 mm longis, vix 1.5 mm latis, obtusis, adnatis, contiguis vix confluentibus, coriaceis, superne pilis minutis crinitis albis sparsis, cucullatis, inferne tomento cinereo completis; venis ca. 7-pari-

bus, simplicibus, superne conspicuis; soris ca. 3-paribus, per tomentum erumpentibus, ferrugineis, indusio non detecto.

DUTCH NEW GUINEA: Lake Habbema, altitude 3,225 meters, *Brass* No. 9116, type; "Material from robust plant with stem 2 m long by 20 cm diameter under the fronds, more slender at base; fronds 42, suberect;" No. 9113, same place, "Along streams of open grassland, in drier shrubberies, never in forest. Material from very old tree 2.5 m high, 16 cm diam. below crown; stem cylindrical with vertical rows of deep scars; living fronds 16 in open crown, about 16 dead ones hanging down."

The mass of basal paleæ is like that of *C. Macgregori*, but somewhat brighter. These, the bullate to cucullate pinnules, and the tomentose axes indicate affinity, but *C. tomentosissima* is much more densely felted. And, in the mass of tomentum, I can detect no indusia. The tomentum may well be responsible for their obsolescence.

83. *CYATHEA WOODLARKENSIS* Copeland.

C. woodlarkensis COPEL., Phil. Jour. Sci. 9 (1914) Bot. 1.

Woodlark Island. *King* 383.

84. *CYATHEA RECURVATA* (Brause) Domin.

C. recurvata (Brause) DOMIN, Acta Bot. Bohem. 9 (1930) 153.

Alsophila recurvata BRAUSE, Engler's Jahrb. 56 (1920) 61.

Sepik region, altitude 800 meters, *Ledermann* 2964. Not seen. "Steht habituell keiner der bekannten *Alsophila*-Arten nahe."

SPECIES NOT PLACED

C. GAZELLAE (Kuhn) Domin, Pterid. (1929) 262.

Alsophila Gazellae KUHN, Forschungsr. Gazelle 4 (1889) 13.

C. ANGIENSIS (Gepp) Domin, Acta Bot. Bohem. 9 (1930) 91.

Alsophila angiensis GEPP in Gibbs, Dutch N. W. New Guinea (1917) 69.

ILLUSTRATIONS

- PLATE 1. *Cyathea costalisora* Copel. sp. nov.; type.
2. *Cyathea everta* Copel. sp. nov.; type.
3. *Cyathea bidentata* Copel. sp. nov.; type.
4. *Cyathea globosora* Copel. sp. nov.; type.
5. *Cyathea pachyrrhachis* Copel. sp. nov.; type.
6. *Cyathea quadripinnatifida* Copel. sp. nov.; type.
7. *Cyathea magna* Copel. sp. nov.; type.
8. *Cyathea horridula* Copel. sp. nov.; type.
9. *Cyathea pilulifera* Copel. sp. nov.; type.
10. *Cyathea melanacantha* Copel. sp. nov.; type.
11. *Cyathea gracillima* Copel. sp. nov.; type.
12. *Cyathea pulcherrima* Copel. sp. nov.; type.
13. *Cyathea parva* Copel. sp. nov.; type.
14. *Cyathea cheilanthoides* Copel. sp. nov.; type.
15. *Cyathea tomentosissima* Copel. sp. nov.; type.



PLATE 1. CYATHEA COSTALISORA COPEL.



PLATE 2. CYATHEA EVERTA COPEL.



PLATE 3. CYATHEA BIDENTATA COPEL.



PLATE 5. CYATHEA PACHYRRHACHIS COPEL.



PLATE 6. CYATHEA QUADRIPINNATIFIDA COPEL.

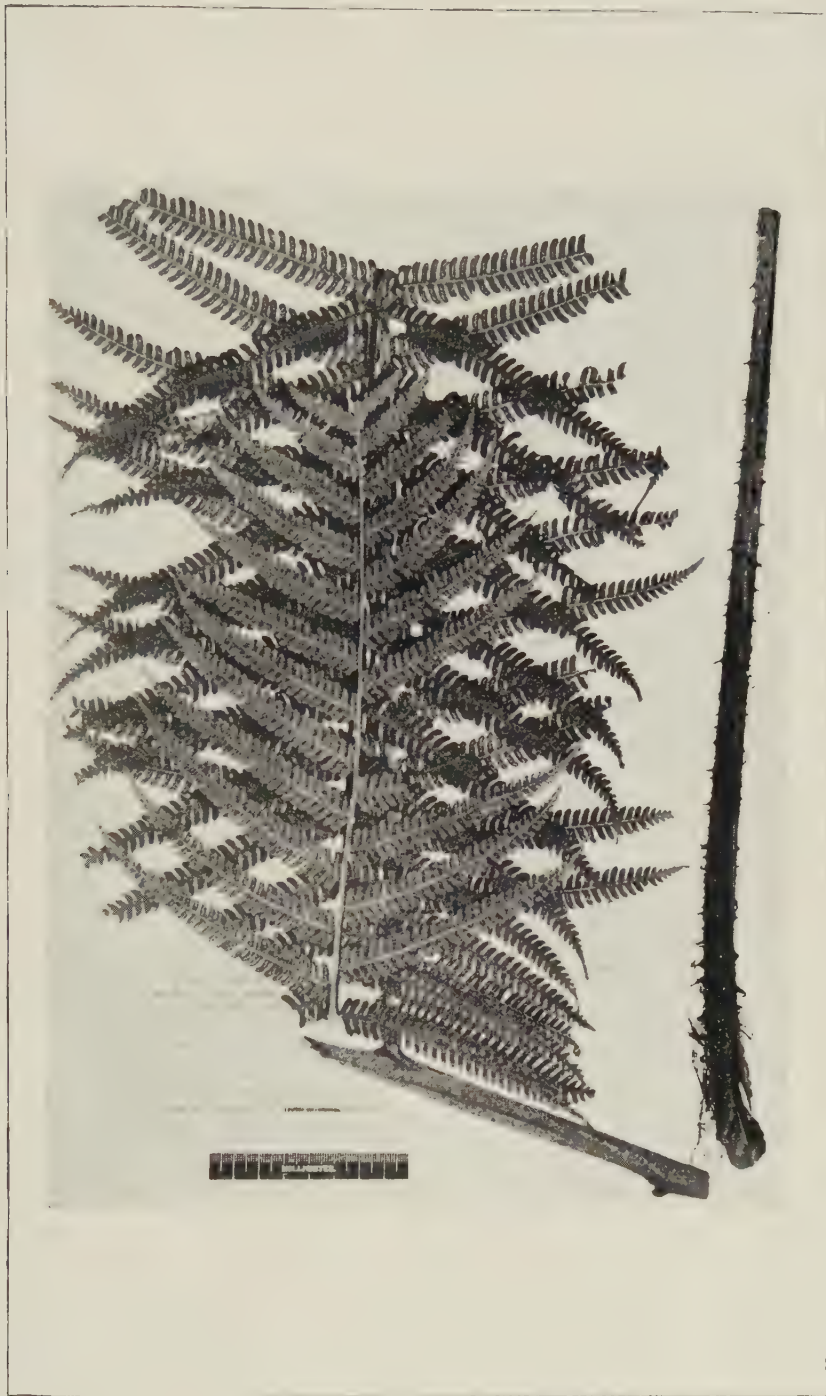


PLATE 7. CYATHEA MAGNA COPEL.



PLATE 8. CYATHEA HORRIDULA COPEL.



PLATE 9. CYATHEA PILULIFERA COPEL.



PLATE 10. CYATHEA MELANACANTHA COPEL.



PLATE 11. CYATHEA GRACILLIMA COPEL.



PLATE 12. CYATHEA PULCHERRIMA COPEL.

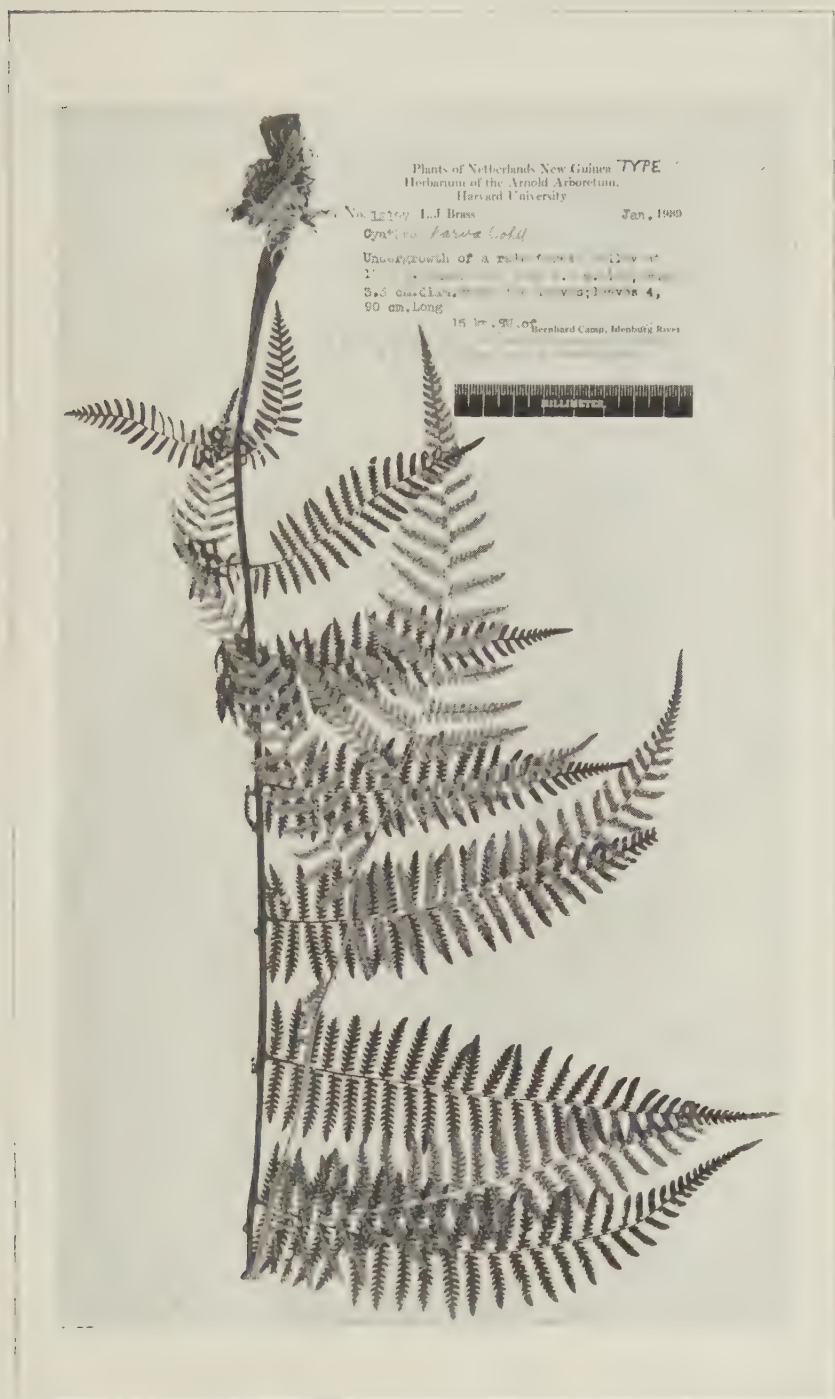


PLATE 13. CYATHEA PARVA COPEL.



PLATE 14. CYATHEA CHEILANTHOIDES COPEL.



PLATE 15. CYATHEA TOMENTOSISSIMA COPEL.

PHILIPPINE PLANTS USED FOR ARROW AND FISH POISONS

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Plants possessing poisonous properties are always of great interest. The number of plants possessing poisonous qualities in the Philippines is reputedly large, and also those recorded as dangerous to life, and useful as drugs, but few have been at all carefully studied, either by analyses or by experiments. Most of the vegetable poisons known to the Filipinos are those which contain well-known alkaloids and other active principles, which have been used as fish poisons, or used for arrows, darts, spears daggers, etc. This paper deals primarily on fish poisons and those used for arrows, darts, spears, etc.

In the preparation of this work, considerable use has been made of Merrill's Enumeration of Philippine Flowering Plants, particularly in matters of scientific and local nomenclature and geographic distribution.

The use of arrow poisons in the Philippines is confined chiefly among the non-Christian tribes, especially those living in the mountains. To these people, the bow and arrow, and the blow-pipe, still constitute their principal weapons for hunting games. The plants used for poison, and the preparation of the poison vary with the tribes and localities. There are very scant data available on arrow poisons in the Philippines. It is quite often difficult to determine and discover the nature of the poisons used. These tribes are of very suspicious nature and often will give misleading statements to anyone who endeavors to ascertain the plants they employ in their preparation. It is more difficult to discover the methods they use in such preparation.

With regards to fish poisons the case is quite different. Very little difficulty was encountered even in the exact determination of the plants used. The aborigines and the Christian Filipinos have many ways of capturing fish. Some of the methods used are ancient, which have been handed down from generation to generation; others have come through contacts with civilization. Perhaps the most interesting method of fishing is the

old native custom of throwing into the water portions of plants to stupefy and later to kill the fish. With the spread of civilization and the enactment of laws, this method is becoming more and more limited. This type of fishing is destructive in a way, as it destroys small as well as large fish. The plants have been used to stupefy and kill fish in order to facilitate their capture. The practice is of great botanical and ethnological interest. Most of the plants used are wild, but a few are cultivated in the backyards of these people. Most of the poisons contained in these plants belong to certain groups of tannins, saponins, or alkaloids. Some of the plants used contain substances that may prove of value in medicine and in the manufacture of insecticides. The methods of using these plants vary a great deal with different localities. Some of the species are more virulent and potent than the others. All parts may be used in some species; in others certain parts or organs are used, such as bark, roots, fruits, and leaves. The poisons generally and usually act on the respiratory organs of the fish, producing first a stupefying effect and later death. Very often materials of one species are only used; in other cases other species are mixed. Sometimes the plant materials are mixed with earth, earthworms or some other media. The time to stupefy and kill the fish depends upon the species used.

Very little information is available on the physiological active constituents of each individual species, as very few species have been subjected to exhaustive chemical and physiological studies.

ARROW POISONS

ARACEÆ¹

AMORPHOPHALLUS CAMPANULATUS (Roxb.) Blume.

Arum campanulatum Roxb.

Arum decurrens Blanco

Amorphophallus decurrens Kunth.

Local names: *Anto* (Bis.); *ápon* (Tag.); *apong-ápong* (Tag.); *bagáng*, (Ibn.); *bagóng* (Bik., Sul.); *oroi* (Bis.); *pamankilon* (Bis.); *puñgápung* (Tag.); *tigi-nga-magmánto* (Ilk.); *tokod-banuá* (Pamp.)⁽⁴¹⁾

The *puñgápung* is a very common wild herb found in thickets and secondary forests, along the roads, trails, etc., at low and

¹ The families in this work are arranged phylogenetically; the genera and species, alphabetically.

medium altitudes in the settled areas. Also in India through Malaya to Polynesia. (41)

Burkill(10) records that the juice of this plant is mixed with *Antiaris toxicaria* juice in dart poison by the Semangs of Perak, one-tenth part making the poison strong to kill a rhinoceros or a tiger. In the Philippines we have no record of the use of this plant as an arrow or dart poison.

DIOSCOREACEÆ

DIOSCOREA HISPIDA Dennst.

Dioscorea hirsuta Blume

Dioscorea daemona Roxb.

Dioscorea triphylla Blanco

Local names: *Bagai* (Mbo.); *gáyos* (Bes.); *kalút* (Tag., Pamp., Sbl.); *karót* (Ilk.); *karóti* (Sul.); *káyos* (Tag.); *kolót* (Bis.); *korót* (S. L. Bis.); *kulót* (Sbl.); *manó* (Bik.); *namí* (Tag.); *orkót* (Bis.).

Namí is found growing wild, chiefly in thickets and forests at low and medium altitudes throughout the Philippines. It is rarely cultivated. It also occurs in India to southwestern China and Formosa through Malaya to New Guinea.

According to Gorter(20) the tubers contain a poisonous alkaloid, dioscorine. Ridley(53) quotes Schutte² who states that dioscorine acts as a poison resembling picrotoxin. It is a paralyzant of the nervous system but not a protoplasmic poison. Leyva and Gutierrez(36) conducted a toxicological studies of namí, and concluded that the toxicity is due to an alkaloid alone. They add that besides the physiological actions of namí, it is also known to produce narcotic effect.

Burkill(10) states that the juice of the tubers are often used in criminal poisoning and is an ingredient with *Antiaris toxicaria* in the preparation of arrow poisons.

PIPERACEÆ

PIPER spp.

The Philippines is endowed with many species of *Piper*, but none have been reported as being used in arrow poisoning. Many species are sufficiently irritant to be injurious in a small degree. Burkill(10) reports that these plants are used only as adjuncts in arrow and dart poisons not only in Malaysia but also in South America.

² Chem. Centrab. 2 (1893) 30.

MORACEÆ

ANTIARIS TOXICARIA (Pers.) Lesch.

Ipo toxicaria Pers.

Local names: *Dálit* (Tag.); *ditá* (Ibn., Ap.); *ipo* (Tag.); *lata* (Neg.); *upas* or *ipoh* (Malaya, Java).

This species has been reported to occur in Cagayan and Apayao in Luzon, Mindoro, and Guimaras, in forests at low and medium altitudes; very local. Also found in India to southern China and Malaya.

Chopra, quoting Kiliani,⁽³⁴⁾ states that the poison contains the following constituents: (1) antiarol; (2) potassium nitrate in large amount; (3) a crystalline resin, named antiar-resin; (4) a crystalline protein; (5) an acid; (6) three active glucosides: (a) d-antiarin, (b) B-antiarin, (c) antiarin. These glucosides occur in varying amounts and are said to possess strong digitalislike action on the heart. Pharmacological studies show that the drug is a very powerful heart poison.

Bacon⁽²⁾ studied chemically the active constituent of a small amount of arrow poison from the northern part of Mindoro, near Bulalacao, evidently the sap of a tree. The milky sap was exceedingly bitter and had a high viscosity. The results obtained indicated the presence of a glucoside rather than an alkaloid. He said that as the reactions correspond closely with those of the glucoside antiarin, from *Antiaris toxicaria*, he immediately suspected that the arrow poison in question was from this tree. Poisoned arrows obtained from the Tagbanuas at San Antonio Bay, near the south end of Palawan, were also tested. These arrows are used in blow guns, and the poison was placed on the bark and shaft. This arrow poison had a consistency like rubber and it resembled in this respect the dried sap of *Antiaris toxicaria*. Experiments were conducted with the use of guinea pigs, and he indicated that the results were typical of many others made on this powerful poison. Seligmann⁽⁵⁸⁾ discusses fully the physiological action of the Kenyan dart poison, *Ipoh*, and its active principle, antiarin.

The poison is also used in Tonkin, Annam, Indo-China and Burma, by all pagan tribes of British Malaya; tribes of Sumatra and Borneo, Java, Bali, Flores, Timor, Celebes, Ternate, Sunda Islands, etc. It is the chief poison in these areas, but is sometimes mixed with *Strophanthus* and *Strychnos* and others. The latex is sometimes used pure, but it is more commonly mixed with other poisons. Burkill⁽¹⁰⁾ describes fully the discovery

and the use and preparation of the poison. To act, this poison must enter the blood stream. Watt(66) narrates lengthily on the use of this plant as an arrow poison. Gimlette(19) records that the milky sap of the Upan tree was formerly used in warfare by Malays as an effective poison for arrows and blowpipe darts. He further states that arrows and darts poisoned with the latex of this plant are still used by the pagan tribes of Borneo and Sumatra in intertribal warfare. He further adds that the Negritos of the east coast (Pangan and Semang) use, in addition to the sap from the bark of this tree, the bark and sap of other trees, such as the bark of *Pangium edule*, etc.; and the poisons from scorpion, centipede, and any kind of poisonous snake. Description of the various methods of preparing the poison is also included. Ridley(53) describes the tree, and the experiments conducted on the action of the poison, the remedies and antidotes, and the chemistry.

Skeat and Blagden(59) state that the Malays called the arrow and dart poison "Ipoh." Two chief substances (either separately or in combination) form its basis, and are derived from the Ipoh tree (*Antiaris*) and Ipoh creeper (*Strychnos*). *Derris elliptica* is but rarely used as an ingredient.

Speaking of *Antiaris toxicaria*, Sulit(62) describes briefly the local preparation of the poison as follows: the milky juice which flows freely when an incision is made of the bark, is a virulent poison. The Mangyans of Mindoro and the wild tribes of Cagayan, especially the Apayaos and the Negritos, dip their darts into the sap and use these in bringing down games. The Negritos of Cagayan make the poison more effective by mixing putrid meat with the juice.

According to Chopra(12) the juice derived from the leaves or the bark of the tree is distinctly poisonous. The sap is dark brown, with a gummy consistency, bitter and biting in taste. It is used to this day as an arrow poison by the Karens in Java, Malaya, and particularly in Burma. Dymock, Warden, and Hooper(14) state that in Tonkin the poison is prepared from the leaves.

MENISPERMACEÆ

COCCULUS LAURIFOLIUS DC.

The species has been reported only from Bontoc (Luzon) and Mindoro, in thickets, at an altitude of from 700 to 1,200 meters. Also found in India to China and Japan southward to Java.

Wehmer(68) records that the roots and leaves contain a toxic principle, codawin.

Caius(11) reports that the jungle tribes of the Malay Peninsula use this plant to poison their arrows and darts.

We have no record available that the plant has ever been used as arrow poison in the Philippines.

TINOSPORA RUMPHII Boerl.

Menispermum crispum Linn.

Menispermum rimosum Blanco

Tinospora crispa F.-Vill.

Tinospora cordifolia F.-Vill.

? *Cocculus cordifolius* Walp.

Local names: *Makabúhai* (Tag., Bis., Ilk.); *paliaban* (Bis.); *panauan* (Bis.); *pañgiauan* (Bis.); *pañgiauban* (Bis.); *sañgaunau* (Bag.); *taga-nagtana* (Bis.).

The species is very common, found in Luzon, Culion, and Basilan in the Philippines, in and about towns, in thickets, probably in most or all islands as it is frequently planted; perhaps introduced. Also recorded from Malaya, Ceylon, and India (under *T. crispa* Miers.).

Wehmer(68) quotes Hartwich³ who reports that the whole plant contains a bitter principle, colombine, 2.22 per cent traces of an alkaloid; and a glucoside. He(68) further records that the plant contains an amorphous bitter principle, picroretine, and traces of berberine. Greshoff(23) isolated from the root-bark a bitter principle (which is not a glucoside) and some alkaloid. Boorsma(6) isolated from the leaves picroretin, traces of an alkaloid, and a substance similar to glyzirrhizin. In the Philippines Bacon(1) reports that the bitter, aqueous extract of the stem does not contain an alkaloid. He, however, found amorphous and resinlike substances. Feliciano,(15) who reexamined the plant, concluded that it contains berberine, a glucoside and a bitter principle. Marañon,(39) restudying the plant, states that the bitter principle is glucosidal in nature.

While the makabúhai is a very common household medicinal plant, the juice being very bitter, yet we have no report that it is being used as an arrow poison. Caius(11) reports that the jungle tribes of the Malay Peninsula use the plant in the preparation of their arrows and dart poisons.

LEGUMINOSÆ

ABRUS PRECATORIUS Linn.

Local names: *Agaion* (C. Bis.); *aguiañgiang* (Bis.); *aroiñgiáng* (Bis.); *pañgati* (C. Bis.); *bugaióng* (Ilk., Bon., Pang.); *bugbu-gaióng* (Ilk.); *gu-*

³ Neue Arzneidrogen (1897) 389.

máling (Bon.); *gikos-gikos* (Bis.); *kansasága* (Pamp., Tag., Bik.); *kaloo* (Iv.); *kasasága* (Pamp., Tag.); *lamodiak* (Bag.); *lága* (C. Bis.); *lása* (Iv.); *manḡgadolong* (Bis.); *oiñḡia* (Bis.); *mátang-púne* (Bis.); *sága* (Tag.); *saga-sága* (Tag.); *saga-mamín* (Tag.).

Very common vine throughout the Philippines at low and medium altitudes, in thickets. Pantropic in distribution, although probably a native of tropical Asia.

Wehmer(68) records that the seeds contain a toxalbumin, abrin, which is very toxic; abralin; abrassic acid, hemagglutinin, lipase and urease.

Sulit(62) gives the following account of this species as an arrow poison. He says that the seeds are powdered and formed into a pastelike mash with which the darts or arrows are dressed. Wounds caused by arrows poisoned with this mash are generally fatal within 24 hours. Boiling the seeds renders the poison ineffective. Local tribes seldom avail themselves of this poison on account probably of its slow effect. According to Burkill(10) the poisonous substance in the seeds is abrin.

DERRIS ELLIPTICA (Roxb.) Benth.

Galedupa elliptica Roxb.

Cylista piscatoria Blanco

Galactia terminaliflora Blanco

Millettia splendidissima Vidal

Millettia piscatoria Merr.

Local names: *Báuit* (Tag.); *lapák* (Bik.); *malasiag* (Tag.); *tibalaru* (Tag.); *tibanglán* (Tag.); *tubali* (Tag.); *tublí* (P. Bis., Tag., Buk.); *tuglí* (Tag.); *tuglíng-pulá* (Tag.); *tuva* (Iv.); *upei* (Bon.).

Tublí is a very common species, its distribution in the Philippines extending from northern Luzon to Mindanao. It is also found in Chittagong, through Malaya to New Guinea and the Bismarck Archipelago.

Wehmer(68) records that the roots contain a toxic principle, rotenone.

According to Gimlette(19) the sap of this plant combined with that of *Antiaris toxicaria* is used in Borneo as one of the ingredients of the Kayan dart and arrow poison for hunting. A similar use of the sap by the pagan tribes of the Malay Peninsula was reported by Newbold,(43) and by Ridley.(53) While the species is quite abundant in the Philippines, its use has only been limited to fish poison and as an insecticide.

DERRIS TRIFOLIATA Linn.

Robinia uliginosa Roxb.

Balbergia heterophylla Willd.

Galedupa uliginosa Roxb.

Pongamia uliginosa DC.
Pterocarpus frutescens Blanco
Derris uliginosa Benth.
Derris diadelphus Naves

Local names: *Asiasimánan* (Tag.); *butong* (Bis.); *hiñgasín* (P. Bis.); *hiñgasinan* (P. Bis.); *manñgasín* (Tag.); *sabuko* (Bag.); *salasila* (Tag.); *tuba-tuba* (Yak.).

Derris trifoliata is found abundantly throughout the Philippines on muddy shores, along tidal streams, etc. It occurs also in tropical East Africa, Asia, through Malaya to Australia and Polynesia.

According to Power(49) the plant contains considerable amount of tannin and red coloring matter. Besides gum and sugar the stems contain an appreciable amount of inorganic salt, notably potassium nitrate. Power states that the toxic effect on fish, however, is evidently due to some constituent of that portion of the resin which is soluble in chloroform and not to the tannin which the plant contains. He further says that no alkaloid was found by him.

Burkill(10) quotes Perrot and Vogt⁴ who state that in the Island of Aurora, New Hebrides, arrows which have been poisoned by dipping their heads into a corpse are further poisoned by means of an infusion of this plant.

MUCUNA PRURIENS (Linn.) DC.

Dolichos pruriens Linn.
Stizolobium pruriens Medic.
Carpopogon pruriens Roxb.
Negretia pruriens Blanco
Mucuna atropurpurea F.-Vill.

Local names: *Hípoi* (Bik.); *ípe* (Pamp.); *lipai* (Tag.); *nípai* (Bis., Tag.); *nípoi* (Bik.); *cowhage* (Engl.).

Mucuna pruriens is found in Rizal and Laguna Provinces in dry thickets and secondary forests at low altitudes. It also occurs in India to Malaya.

The Mucunas are noted for possessing very irritating hairs. The irritation is often so intense that they are generally regarded as poisonous. The hairs produce notable itching first followed by pain, redness, swelling and even an eruption. According to Grieve(24) the hairs of the pods are usually filled with air, but sometimes contain granular matter, with tannic acid and resin.

⁴ Trav. Lab. Mat. Med. Paris 12 (1913) 238.

According to Dalziel⁽¹³⁾ the stinging hairs of this species and other species are sometimes used as an accessory ingredient in arrow poison in West Tropical Africa.

RUTACEÆ

LUNASIA AMARA Blanco.

Pilocarpus amara Blanco

Rabelaisia philippinensis Planch.

Lunasia philippinensis F.-Vill.

Lunasia reticulata Elm.

Local names: *Apdong-káhoi* (Tag.); *bungláí* (Bik.); *dayangdang* (Ilk.); *labau* (S.L.Bis.); *lubi-lubi* (C.Bis.); *lunas* (Tag.); *pait* (Bik., Tag.); *paítan* (Bis., Ilk.); *palatañgan* (Cad.); *papait* (Bik.); *saltiki* (Tag.); *santiki* (Tag.).

Common plant reported from northern Luzon to Mindanac, and Palawan, in thickets and forests at low and medium altitudes. Endemic.

Wehmer⁽⁶⁸⁾ records that the bark contains a glucoside, rubelaisine, and two amorphous alkaloids, lunacrine and lunasine.

The use of this plant as an arrow poison is doubtful. Brill and Wells⁽⁷⁾ mention the confusion in names as due to the fact that this plant has been confused with *Lophopetalum toxicum* by earlier workers.

MELIACEÆ

LANSIUM DOMESTICUM Correa.

? *Baccaurea sylvestris* Lour.

? *Melia parasitica* Osbeck

Local names: *Boboa* (Bis.); *buahan* (Mbo.⁵, Sul.); *bulahan* (Bis.); *buan* (Mbo.); *bukan* (Bis.); *kaliboñgan* (Mbo.); *lansónes* (Tag., Bik.); *tubuan* (Bag.).

Lansones is cultivated in the Philippines, and semiwild in certain parts of Mindanao. It is also found in Indo-China, Malay Peninsula and Archipelago.

Wehmer⁽⁶⁸⁾ records that the bark and skin of the fruits contain an amorphous toxic, lansium acid; the seeds contain a bitter principle and traces of alkaloid.

The tree is not reported here as a source of arrow poison. Burkill⁽¹⁰⁾ quotes Perrot and Vogt⁶ who record that the latex is used as a Dyak arrow poison.

⁵ The abbreviations for the various local dialects and languages were adopted from Merrill's⁽⁴¹⁾ Enumeration of Philippine Flowering Plants.

⁶ Trav. Lab. Mat. Med. Paris 9 (1913) 206-216.

Ap.	Apáyao	Kul.	Kuláman
Bag.	Bagobo	Kgl.	Kalínga
Bik.	Bíkol	Kuy.	Kuyonon
Bil.	Bilá-an	Lan.	Lanao
Bis.	Bisaya	Mag.	Magindanáo
P. Bis.	Panay Bisáya	Mang.	Mangyán
C. Bis.	Cebu Bisáya	Mand.	Mandáya
S. L. Bis.	Samar-Leyte Bisaya	Mbo.	Manóbo
Ak. Bis.	Aklan Bisáya	Mng.	Mangguárgan
Bon.	Bontók	Neg.	Negrito
Buk.	Bukidnon	Pamp.	Pampagán
Chab.	Chabacáno	Pang.	Pangasinán
Dum.	Dumágat	Sbl.	Sambáli
Gad.	Gaddáng	Sml.	Sámal
Ibn.	Ibanág	Sp.	Spanish
If.	Ifugao	Sul.	Súlu
Ilk.	Iloko	Sub.	Subánun
Ig.	Igorot	Tag.	Tagalog
Ilg.	Ilongót	Tagb.	Tagbanúa
Is.	Isinái	Tagk.	Tagaká-ólo
Ism.	Isámál	Ting.	Tinggián
Iv.	Ivatán	Tir.	Tirurái
		Yak.	Yakán

EUPHORBACEÆ

CROTON TIGLIUM Linn.

Croton camaza Perr.*Croton glandulosum* Blanco*Croton muricatum* Blanco*Tigllium officinale* Klotz

Local names: *Gasi* (Sul.); *kámagsa* (Bik.); *kamisa* (Tag.); *kamandag* (Bis.); *kamausa* (Tag.); *kásla* (Sul.); *lutung-sira* (Bik.); *makáisa* (Tag.); *makásla* (P. Bis.); *Malapai* (Sul.); *Saligau* (Ilk., Ibn.); *túba* (Ilk., Bik., Tag.); *tubang-makaísa* (Bik., Tag.); *tubang-pasiti* (Bik.); *túbli* (C. Bis.); *túkbú* (If.).

This species is of prehistoric introduction into the Philippines, found throughout the Archipelago in and about towns, usually planted, sometimes naturalized. Also found in India to New Guinea.

Wehmer(68) records that the seeds contain a toxic alkaloid, ricinine. The bark contains 65 per cent tannin. Gimlette(19) also says that various glycerides, glycerin esters, acids, and especially the irritant crotoleic acid, are contained in croton seeds; they also contain croton-resin from which they derive their vesicant properties, and crotin, a toxic albuminoid principle. Crotin is a vegetable toxalbumin which is chemically

similar to ricin, the toxalbumin of castor oil beans; it also resembles abrin, the toxalbumin of *Abrus precatorius* seeds.

Croton tiglium, according to Burkill,(10) supplies the Arbors of the Eastern Himalaya with an arrow poison. The bark is the part used. The leaves are said to furnish the Bataks of Sumatra with an arrow poison. Gimlette(19) also reports that the leaves are also used as one of the constituents of the Batak arrow poison. He further states that the Arbor arrow poison of the northeastern frontier of Assam is a paste believed to be made by pounding the soft parts of this plant. Waddell(65) reports also that the poisoned arrows of the Arbor tribe of Assam were found to contain croton oil.

The plant is not reported as having been used as an arrow poison in the Philippines. It is on the other hand universally used for poisoning fish.

EXCOECARIA AGALLOCHA Linn.

Local names: *Alipáta* (P. Bis.); *batáno* (Ilk., Pang.); *bota-bóta* (Tag., Bis.); *búta* (Tag.); *buta-búta* (Tag., Pamp., Sul.); *dipodáta* (C. Bis.); *gumainḡat* (Bag.); *himbabau* (Pamp., Bis.); *lĩḡi* (Sbl.); *lipáta* (Bik., Bis., Tag.); *lipátang-buhai* (Tag., Sul.); *siak* (Bis.).

This is a very common species throughout the Philippines along the seashore or within the influence of salt or brackish water. It is also found from India to Polynesia.

Despite the abundance of this plant in the Philippines no report is available that it is being used for poisoning arrows. According to Burkill(10) the latex is used in Malacca, Selangor, and Johore as an adjunct to *Antiaris* sap in making dart poison. Ridley(53) also mentions this plant as being used in dart poison by the wild tribes of Malay Peninsula. In Queensland Hedley(27) reports that the latex is used by the black natives of Port Curtis as a poison for their spears.

JATROPHA CURCAS Linn.

Local names: *Galúmbang* (Pamp.); *kásla* (Bis.); *kirisól* (Tag.); *taba-tabá* (Tag.); *tagumbáu* (Ilk.); *tagumbau-na-puráu* (Ilk.); *takumbau* (Sbl.); *taḡan-taḡan-túba* (Tag.); *taua-tauá* (Ilk., Ig.); *tauuá* (Ilk.); *túba* (Ig., Bik., Tag.); *túbang-bákod* (Tag.); *physic nut tree*, *purging nut tree*, *big purge nut* (Engl.).

Jatropha curcas is found throughout the Philippines and usually very common in and about towns. It was introduced at an early date in colonial history from Mexico, and now pantropic in distribution.

Wehmer(68) records that the seeds contain a toxic principle, toxalbumin curcin. According to Steyn(61) curcin belongs to the same group of toxalbumins as crotin and ricin. The lesions in animals injected intravenously and subcutaneously with curcin are similar to those seen in crotin and ricin poisoning, with the exception that in the case of the former poison (curcin) there is less irritation in the gastro-intestinal tract. The external and internal actions of the oil are similar to those of croton oil, due to the presence of the above acid (crotonoleic type).

According to Dalziel(13) some tribes in the West add the nut to *Strophanthus* seeds in making arrow poison. It is also sometimes an ingredient, along with the latex of *Euphorbia* in the mixture called in Hausa, "gunguma" (Nupe lowu), used to poison corn as a bait for Guinea-fowl.

CELASTRACEÆ

LOPHOPETALUM TOXICUM Loher.

Lophopetalum fimbriatum F.-Vill.

Hippocratea maingayi Vidal

Local names: *Abúab* (Tag.); *abútab* (Tag.); *butiñgi* (Tag.); *buyun* (Sul.); *dayandáng* (Tag.); *ditá* (Neg.); *kalibámagan* (Mand.); *puti-i-bábae* (Lan.); *buti-i-lalaki* (Lan.); *sudkad* (P. Bis.).

The plant has been reported from Rizal, Tayabas, Laguna, and Camarines Provinces in the Island of Luzon; Mindoro; Masbate; Leyte; and Lanao, Zamboanga, and Davao Provinces in Mindanao; and the Sulu Archipelago, in primary forests at low altitudes. Endemic.

Brill and Wells(7) report that the plant contains a physiologically active substance, a saponin, which is poisonous in small quantities. Boorsma(5) isolated a glucoside and named it lophopetalin.

Loher(37) first described this plant, and supplementary to the diagnosis of the species he reported the use of this plant as an arrow poison by the Negritos. Guerrero(25) also reports that the thickened sap of the bark is used by the Negritos and other hillsmen to poison the tips of their arrows.

Brill and Wells(7) investigated the physiological active principle of the plant. They mention that it is well known among the mountain people of some parts of the Philippines, because of the use they make of its bark to poison their arrows, spears and other weapons. The Remontados and Negritos of Rizal Province, these authors further mention, easily prepare the poison. The method is as follows: the bark is removed, soaked,

and bruised. The expressed juice is then evaporated to the consistency of an emulsion. In its preparation care should be taken not to let it come in contact with any sour substances in order not to diminish or neutralize its deadly action. Due to its reaction to warm acids, it is reported that poison is glucosidal compound. It is further stated that the natives always concentrate the juice, as they believe it is harmless when in dilute condition. The change taking place in the dilute juice is probably a hydrolysis to harmless sapogenin by the action of various ferments. They say that heating destroys these ferments and as yeasts will not grow in the concentrated juice, there are no further changes after concentration. They also describe the method used in isolating the poison. They arrive at the conclusion that the plant contains a physiologically active substance, a saponin, which is poisonous in small quantities.

Sulit(62) reports that the bark of this plant yields the poison. He described the preparation of the poison as follows: Sufficient quantity of the bark is triturated and the mash is sprinkled with water. This is placed in a pocket-shaped rattan basket especially made for the purpose and then pressed to extract the juice. The juice is placed in a brass kettle or pot and boiled. During the process of boiling, dried powdered leaves of *Mallotus floribundus* are added to the solution, the liquid being stirred once in a while with a flat stick. When the solution becomes sticky the pot is taken from the fire to cool. After cooling the sticky substance is ready for dressing the arrows. The poison, he reports, is used extensively by the Manobos of Cotabato Province, in Mindanao, and by the Negritos of Tayabas Province.

THEACEÆ

TERNSTROEMIA spp.

The bark of certain species is used as arrow poison and as fish poison in the Philippines. According to Burkill(10) the active principle isolated seems to be a saponin.

GUTTIFERÆ

CALOPHYLLUM INOPHYLLUM Linn.

Local names: *Bangkalan* (Tag.); *batarau* (Neg.); *bitaog* (Ilk., Sbl., Pamp., Tag.); *bitok* (Tag.); *butalan* (Tag., S. L. Bis., C. Bis., Mbo.); *bitaoi* (Pang.); *bitong* (Tag.); *dagkalan* (Tag.); *dangkáan* (Bag.); *dangkalan* (Tag., Bik., P. Bis., Mag.); *díngkalan* (Big., Tag.); *lankágan* (Mag.); *palo-maria* (Neg., Tag., C. Bis., Sul.); *palo maria de playa* (Tag., Sp., Sul.); *pamitaogen* (Ilk.); *tambotambok* (Sul.); *vutalau* (Iv.).

Palo-maria is a characteristic strand tree, throughout the Philippines. It is also found in India to tropical East Africa through Malaya to Polynesia.

Richmond and del Rosario⁽⁵¹⁾ report that kernels contain 70 to 75 per cent bitaog oil and that the oil contains a poisonous resin.

Although the plant is abundant in the Philippines, we have no record that it is being used for arrow and spear poisons. Our knowledge of the use of this plant for spear and arrow poison is due to Reverend Powell,⁽⁴⁸⁾ who gives us an account of the use and virulence of the poison in Samoa.

FLACOURTIACEÆ

PANGIUM EDULE Reinw.

Hydnocarpus polyandra Blanco

Local names: *Paṅgi* (S. L. Bis., P. Bis., Bik., Tag.); *salingkumut* (Mand.).

Paṅgi is known in the Philippines for its edible seeds. It is reported from Camarines and Sorsogon Provinces, Luzon; Palawan, Samar, Leyte, Panay, Negros, and Mindanao, growing in primary forests at low and medium altitudes. It is also reported from Malay Peninsula and Archipelago.

The toxic property is due to a cyanogenetic glucoside, gyno-cardine, isolated by De Jong.⁽³²⁾

No record is available of the use of the plant as an arrow poison in the Philippines. Gimlette⁽¹⁹⁾ cites Vaughan Stevens as authority for the use of this plant as an arrow poison, to the effect that the fresh seeds are used in making dart poison by the Pangan jungle tribes. Gimlette⁽¹⁹⁾ adds that the Negritos of the east coast (Pangan and Semang) use in addition to the sap from the bark of *Antiaris toxicaria*, the bark from *Pangium edule* for arrow poisons. Ridley⁽⁵³⁾ lists this plant also as being used in the manufacture of dart poison by the Sakais and other wild tribes of Malay Peninsula.

EBENACEÆ

DIOSPYROS MULTIFLORA Blanco.

Diospyros lotus Blanco

Diospyros canomoi A. DC.

Local names: *Kanomai* (Ilk.); *kanomoi* (Tag.); *kanumai* (Ilk., Tag.); *maratampui* (Ilk.).

Reported from Luzon (Cagayan, Ilocos Sur, La Union, Pangasinan, Nueva Ecija, Pampanga, Rizal, Laguna, and Batangas Provinces); Leyte; and Zamboanga Province in Mindanao, as

growing in thickets and primary and secondary forests at low and medium altitudes. It is endemic.

The Negritos of Bataan Province poison their arrows by using the bark of this tree. Specimens of this plant brought into the Bureau of Science laboratories have been found to be moderately toxic.(1, 2) It was reported as *Diospyros canomoi*, which is a synonym of this species.

LOGANIACEÆ

STRYCHNOS NOX-VOMICA Linn.

The strychnine tree is of very recent introduction into the Philippines. According to Sulit(62) this species has long been known and used for arrow poison by the wild tribes in Malaya. The poison is obtained from the bark by maceration in water. According to Wehmer(68) the bark yields strychnine and brucine.

APOCYNACEÆ

CERBERA MANGHAS Linn.

Cerbera odollam Gaertn.

Cerbera lactaria Ham.

Elcana seminuda Blanco

Local names: *Arbon* (Tagb.); *baraibai* (Tag.); *batáno* (Ilk.); *buta-butá* (Tag.); *butó-butó* (C. Bis.); *ditá* (Sul.); *dungas* (Mag.); *kaliptan* (Ilk.); *lipáta* (Tagb.); *lipáttag* (P. Bis.); *magkanai* (Bik.); *marai bai* (Tag.); *marabai* (Tag.); *panabulon* (P. Bis.); *totok-kálau* (Tag.); *tabau-tabau* (Ilk.).

Common along the seashore throughout the Philippines. It is also reported from tropical Asia through Malaya to tropical Australia and Polynesia.

Wehmer(68) records that a glucoside, cerberine, was isolated from the seeds. A bitter principle, odollin, was also isolated. Gimlette(19) states, on the other hand, that a glucoside known as thevetin, a cardiac poison, which also occurs in *Thevetia peruviana*, has been found in the milkylike juice of all parts of this plant.

Gimlette,(19) in his interesting book of Malay poisons and charms, mentions the use of the oil expressed from the seeds of this plant, in certain parts of the Dutch East Indies to smear on spears and daggers to poison the blade.

Despite the abundance of the plant in the Philippines, no record is available that it is used as an arrow poison.

STROPHANTHUS CUMINGII A. DC.

Strophanthus dichotomus DC. var. *luzoniensis* Vidal
Strophanthus erectus Merr.

Local names: *Abúnag-báging* (Tag.); *lánót* (Ilk.); *lasín* (Ibn.); *sara-sara* (Ilk.).

Reported from Cagayan, Abra, Ilocos Norte, La Union, Batangas, Rizal, Cavite, Bataan, Laguna, and Sorsogon Provinces in Luzon; Palawan; Leyte; Negros; and Davao Province in Mindanao, growing in thickets and forests at low and medium altitudes. It is endemic.

Brown(8) reports that the bark is employed as an effective arrow poison. Sulit(62) also records this species as useful arrow poison.

VERBENACEÆ**CLERODENDRON VILLOSUM Blume.**

Clerodendron infortunatum Walp.
Clerodendron Curranii Elm.

Clerodendron villosum is found in old clearings, thickets, etc., at low altitudes in Culion, Palawan, Balabac, Bancalan. It also occurs in Burma, Malay Peninsula, Penang, Sumatra, Java, and Borneo.

According to Chopra(12) the plant contains a bitter principle.

Skeat and Blagden(59) say that the Manterases use the leaf for skimming dart poison.

CUCURBITACEÆ**MOMORDICA CHARANTIA Linn.**

Momordica balsamina Blanco
Momordica cylindrica Blanco

Local names: *Amargóso* (Sp.); *ampalayá* (Tag.); *ampaliá* (Tag.); *apalayá* (Tag.); *apaliá* (Pamp.); *apápe'* (Ibn.); *apápet* (Ita.); *margóso* (Tag.); *paliá* (Bis., Bon., If.); *pariá* (Bik., Ilk., Sul.); *puliá* (Sub.); *saligun* (Sul.); *balsam apple*, *balsam pear*, *African cucumber*, *tuberculated Momordica*, *bitter gourd* (Engl.).

Ampalayá is found throughout the Philippines, in cultivation and also thoroughly naturalized in thickets, waste places, etc., at low and medium altitudes. It is pantropic in distribution.

Greshoff(22) reported in 1898 the presence in the leaves of a bitter alkaloid and a glucoside. In 1904 Peckolt(46) isolated from the leaves and fruits a bitter principle, momordicin.

Steyn(61) quotes Descourtilz, who states that two or three drachms of the fruits taken internally will kill a dog.

According to Dalziel⁽¹³⁾ some Benue tribes include the plant as an ingredient in *Strophanthus* arrow poison.

FISH POISONS

ARACEÆ

ALOCASIA MACRORRHIZA (Linn.) Schott.

Arum macrorrhizon Linn.

Calla maxima Blanco

Arum grandifolium Blanco

Calla badian Blanco

Alocasia indica Naves

Local names: *Abá* (Ibn.); *aba-ába* (Ig.); *badiáng* (Tag., Bis.); *bagiáng* (Bis.); *bira* (Ilk.); *bíga* (Tag., Ilk., Bis., Pamp.); *bilbila* (Bon.); *gabí* (Bik.); *galiáng* (Bis.); *gandus* (Pamp.); *malabíga* (Tag.); *ragiáng* (Bis.); *sininába* (Ilk.); *talipan* (Bik.); *taliáng* (Bis.).

Bíga is common throughout the Philippines, in old clearings and secondary forests, at low and medium altitudes. Also reported from India to Malaya. It is planted for ornamental purposes in other tropical countries.

The juice from the trunk and leaves is an irritant. No report, however, is available that the plant is being used locally for poisoning fish. In Queensland, particularly in Monduran and among the upper Burnett blacks, Hamlyn-Harris and Smith⁽²⁶⁾ record the plant as a fish poison. They say that the leaves of this plant are cyanophoric. Howes⁽³¹⁾ also mentions this plant as a fish poison in Australia.

DIOSCOREACEÆ

DIOSCOREA HISPIDA Dennst.

Dioscorea hirsuta Blume

Dioscorea daemon Roxb.

Dioscorea triphylla Blanco

Local names: *Bagai* (Mbo.); *gáyos* (Bis.); *kalút* (Tag., Pamp., Sbl.); *karót* (Ilk.); *karóti* (Sul.); *káyos* (Tag.); *kolót* (Bis.); *korót* (S. L. Bis.); *kulót* (Sbl.); *mamó* (Bik.); *namí* (Tag.); *orkót* (Bis.).

Namí is found growing wild, chiefly in thickets and forests at low and medium altitudes throughout the Philippines. It is rarely cultivated. It also occurs in India to southwestern China and Formosa through Malaya to New Guinea.

Regarding the active principle, physiology and toxicology of *namí*, see under Arrow Poison.

Namí tubers when fresh are crushed or chopped to pieces and are used to poison fish.

MYRICACEÆ

MYRICA RUBRA S. & Z.

Morella rubra Lour.

Common names: *Cham-poi* (Tag.); *Cham-pu* (Chinese); *box myrtle*, *bay berry*, *Chinese strawberry* (Engl.).

Myrica rubra is found in Zambales Province in Luzon, and in Palawan, on the higher mountains. It also occurs in Japan, China, Korea, and Formosa.

Wehmer(68) records that the bark contains myricitrin isolated by Shibata and Kimotsuki.⁷

There is no local record of its use as a fish poison. Greshoff(22) reports that in the Khasia hills the bark is used to poison fish.

POLYGONACEÆ

POLYGONUM BARBATUM Linn.

Polygonum stoloniferum Blanco

Polygonum persicaria Walp.

Local names: *Bukákau* (Bik.); *kanubsúban* (Pamp.); *kaykáyu* (If.); *saimbañgan-tubig* (Sul.); *sigan-lúpa* (Tag.); *subsúban* (Tag.).

Polygonum barbatum is a fairly common species distributed from northern Luzon to Mindanao, growing in open, usually wet, places, at low and medium altitudes, ascending to 1,400 meters in some regions. It is also found in India to Africa to Malaya.

According to Kalaw and Sacay(33) the leaves and roots are poisonous to fish in the Philippines.

POLYGONUM ORIENTALE Linn.

This species is found in Pampanga and Rizal Provinces in Luzon; and in Lanao and Bukidnon Provinces in Mindanao, in open waste places along streams, at low and medium altitudes. It is also found from India to Japan southward to Australia.

Maurin(40) reports the presence of 0.50 per cent of oxymethylanthraquinone in the leaves.

Although the species is present in the Philippines, we have no record of its use as a fish poison. The Port Curtis blacks in Queensland, according to Roth,(54) use this plant for obtaining fish. The plant is pounded and thrown into a water-hole, thus

⁷ Act. Phytochim. Tokyo (1923).

bringing all the fish to the surface in a dying condition without their wholesomeness as food being impaired.

MENISPERMACEÆ

ANAMIRTA COCCULUS (Linn.) W. & A.

Menispermum cocculus Linn.

Local names: *Arai* (Bag.); *balasin* (Tag., Bis.); *bayáti* (Tag.); *bayating* (Ilk.); *lábtang* (Ilk., Ig.); *lágtal* (Bis.); *lágtang* (Bis., Mbo., Sul.); *lák dang* (Bis.); *láktang* (Tag., Bis., Pamp.); *lánta* (Tag., Pamp.); *ligtang* (Tag.); *liktang* (Tag., Bis.); *suma* (Tag.).

This species is common from northern Luzon to Mindanao, growing in thickets at low and medium altitudes. It is also found in India, through Malaya to New Guinea.

Wehmer(68) records that the seeds contain bitter principles—picrotoxin, picrotoxinin, picrotin, and cocculin; and two alkaloids—menispermine and paramenispermine.

This plant is one of the commonest used as a fish poison in the Philippines. Tavera(63) reports that the fruits are thrown in small streams or in lakes to stupefy fish. According to Bacon(1) the fruits are the parts of the plant used for fish poisoning. The action of the substance is due to the very poisonous bitter principle, picrotoxin. Poisoning due to eating the fish obtained by this means has often occurred.

Brown(8) states that the powdered fruits of this plant are put in water to kill fish. In preparing the poison the fruit is first heated until dry and then crushed and powdered. The fruits are poisonous not only to fish, but also to other animals.

Kalaw and Sacay(33) mention also the fruit as the part used in poisoning fish. They say that hydrocyanic acid is present in the leaves, bark and roots; saponin is present in all these parts. According to Watt(66) the bitter fruits are used in India to poison fish. Howes(31) records that this species is one of the best known of Asiatic fish poisons, and its fruits have long been known to possess peculiar and poisonous properties. Their use for this purpose has even extended to European countries, and it is stated that, as a result of cases of poisoning among those who have consumed fish caught in this way, it has been found necessary in some countries to forbid the sale of the berries except to pharmacies. Cases are on record of poachers making use of the berries for capturing trout in some of the English rivers. A common method of using the berries in Eastern countries is to grind them to a powder and then make into a thick

paste with boiled rice. In this form a small quantity is sufficient to render fish, birds, and certain animals insensible. As an alternative the berries in a partly crushed state may be thrown into the water. Russell(55) also reports the toxic properties of the fruits due to an alkaloid, menispermene, and to picrotoxin.

CISSAMPELOS PAREIRA Linn.

Cissampelos discolor DC.

Cissampelos discolor DC. var. *cardiophylla* A. Gray

Cissampelos Cumingiana Turcz.

Local names: *Abodo* (C. Bis.); *bangbāṅgau* (Ilk.); *batang-batang* (Tag.); *gulagulamánan* (Tag.); *hampapáre* (Bis.); *himpapára* (Bis.); *kalaad* (Ilk.); *kalakalamáyan* (Tag.); *kalkaláad* (Ilk.); *kauas* (Sub.); *kuskusipa* (Ilk.); *makabó-o* (Tag.); *malaráto* (Ibn.); *samang* (Bon.); *sampáre* (Bis.); *sansáu* (Tag.); *sinchá-o-sincháuan* (Tag.); *sinsau-sinsaúan* (Tag.).

This species is common throughout the Philippines, in thickets, at low and medium altitudes. It is pantropic in distribution.

Wehmer(68) records that the roots contain an alkaloid, sepeerrine, 0.5 per cent, and cissampeline.

The roots are pounded and thrown into a river or pool to stupefy fish. Burkill(10) reports the use of this plant also as a fish poison in Malaya. He further states that the alkaloid in the root of this plant is identical with that in the drug, *Pareira brava*.

TINOMISCIMUM PHILIPPINENSE Diels.

Local names: *Bayátang* (Pamp., Tag.); *kalumpáṅgi* (Bag.).

The species is reported from Pangasinan, Tayabas, and Laguna Provinces in Luzon; Biliran; Lanao and Davao Provinces in Mindanao, as growing in forests at low and medium altitudes. It is endemic.

According to Feliciano and Santos(16) the fruits contain picrotoxin.

According to Villadolid and Sulit(64) the fruits are used as a fish poison. They describe the preparation of the poison as follows: The ripe fruits are roasted until they turn coffee-colored; then they are pulverized with earthworms cut into pieces the size of kernel of corn. The mixture is ready as fish poison. In Pansipit River, in Batangas Province, the practice is to mix the powdered fruits with crushed "katang," small freshwater crabs. The poison is applied by scattering the mixture in a pool of water or in any portion of the river where the water is quiet. Application in the evening is recommended. The stunned fish may be collected early next morning.

CAPPARIDACEÆ

GYNANDROPSIS GYNANDRA (Linn.) Merr.

Cleome gynandra Linn.

Gynandropsis pentaphylla DC.

Pedicellaria pentaphylla Schrank

Sinapistrum pentaphyllum Medic.

Cleome alliacea Blanco

Cleome alliodora Blanco

Local names: *Apoi-apoián* (Tag.); *balabalanóian* (Tag.); *halayá* (P. Bis.); *huláya* (P. Bis.); *tantandók* (Ilk.); *tantandók-a-dadakkel* (Ilk.).

Gynandropsis gynandra is found throughout the Philippines, at low and medium altitudes, occurring as a weed in waste places and often abundant especially near the sea. It is pantropic in distribution.

Planchon and Collin(47) state that the plant yields an acrid, volatile oil, having the properties of garlic or mustard oil.

According to Watt(66) the plant is used as a fish poison.

LEGUMINOSÆ

ALBIZZIA ACLE (Blanco) Merr.

Mimosa acle Blanco

Pithecolobium acle Vidal

Xylia dolabriformis Vidal

Local names: *Akle* (Sbl., Tag., Pamp., Tagb., P. Bis.); *banúyo* (P. Bis.); *kitakíta* (Ilk., Pang.); *lañgin* (P. Bis.); *lañgip* (Bis.); *mabun̄ga* (Tag.); *sauriri* (Tagb.); *solungkigi* (Tagb.); *tabalañgi* (Bis.); *tili* (Sbl.); *tilis* (Sbl.).

The species is found from northern Luzon southward to Palawan and Negros, in forests, at low and medium altitudes. It is endemic.

The bark of this plant is said to be used as a fish poison. It contains saponin.

ALBIZZIA PROCERA (Roxb.) Benth.

Mimosa procera Roxb.

Mimosa coriaria Blanco

Local names: *Acháan* (Ig.); *adáan* (Ilk., Ting.); *adáan-bákir* (Pang.); *adian̄gau* (Tag.); *ayan̄gau* (Tag.); *akleng-párang* (Ilk., Sbl., Tag.); *alalanad* (Tag., Pamp.); *alalan̄gad* (Tag.); *anaplá* (Mang.); *anin̄pla* (Tag.); *anitap* (Pamp.); *boak* (Ig.); *dáan* (Ilk.); *darian̄gau* (Tag.); *kálai* (Ting.); *káral* (Ibn., Pang.); *karáil* (Sbl.); *karáol* (Sbl.); *payhod* (Bis.); *payhot* (Bis.); *palatangan* (Ilk.).

This species is found from Cagayan to Batangas Provinces in Luzon; Mindoro and Busuanga, common in thickets, second-

growth forests, parang, etc., at low altitudes, in regions subject to a long dry season. It is also found from India to central China southward to tropical Australia.

The bark of this plant is said to be used as a fish poison. The bark contains saponin. Kalaw and Sacay(33) also report a great amount of saponin in the bark, and a fair amount in the leaves and roots. Howes(31) also records this species as a fish poison in Australia.

ALBIZZIA SAPONARIA (Lour.) Blume.

Mimosa saponaria Lour.

Albizzia tomentella Merr.

Albizzia lucida F.-Vill.

Local names: *Balógo* (Bbo.); *balóyo* (Sul.); *gógo-kásai* (Tag.); *gógong-tokó* (Tag., Pang.); *gúgong-tukó* (Tag.); *gúgong-malatukó* (Tag.); *haunaki* (Bik.); *hinaki* (C. Bis.); *inauaki* (Bis., Bik.); *kogon-toko* (Tag.); *karikir* (Bag.); *katumbal* (Bag.); *malatoko-gugu* (Tag.); *malatukó* (Tag.); *malatukú* (Tag., Pamp.); *marataoka* (Ilk.); *maratéka* (Ilk.); *maratika* (Ilk.); *martiga* (Ilk.); *masugat* (Yak.); *paltauin* (Tag.); *pipi* (P. Bis.); *salang-kúgi* (P. Bis., Sul.); *salang-kúgi* (P. Bis.); *salingígi* (Tag.); *salingkógi* (Tag.); *saling-kúgi* (Bik.); *sologígi* (S. L. Bis.); *salukígi* (S. L. Bis.); *salungígi* (P. Bis.); *siañgingi* (Mbo.); *sankugi* (C. Bis.); *sankugu* (C. Bis.); *saplit* (Ilk.); *siangkúgi* (Mbo.); *tagumtagum* (Mbo.); *tagurarit* (Pang.); *tambing* (Ig.); *tigian* (P. Bis.); *tanaki* (Bis.); *unaki* (Bik.); *upi* (If.).

A common species in forests, parang, etc., at low and medium altitudes in the Philippines. It is also reported from Indo-China through Malaya to the Moluccas.

According to Kalaw and Sacay(33) the bark is used as a fish poison in the Philippines. They report the presence of both hydrocyanic acid and saponin in the leaves, bark, and roots. Bacon(1) reports that the bark contains one of the saponin glucosides. Wehmer(68) records the presence of saponin and traces of alkaloid in the bark and seeds.

CAESALPINIA PULCHERRIMA (Linn.) Sw.

Poinciana pulcherrima Linn.

Local name: *Caballero* (Sp., Tag.) in all provinces.

This ornamental, which is of very recent introduction into the Philippines, is cultivated throughout the Archipelago. It is widely cultivated and naturalized in the Tropics of both hemispheres.

Although the plant is common here, its use as a fish poison is not known in the Philippines. For our knowledge of its use as a fish poison, we are indebted to Standley,(60) who reports

that in Guatemala the leaves are thrown into the water to stupefy fish.

DERRIS ELLIPTICA (Roxb.) Benth.

Derris elliptica is abundant in thickets along streams, secondary forests, etc., at low and medium altitudes from northern Luzon to Mindanao. The plant is also cultivated for its roots as an insecticide. It is also reported from Chittagong through Malaya to New Guinea and the Bismarck Archipelago.

Brown(8, 9) reports that the roots are used to poison fish in the Philippines. Rumpf, in the Herbarium Amboinense, describes this plant as a fish poison. Burkill(10) and Gimlette(19) describe the preparation of the poison and the method used in fishing in Malaya. Chopra(12) lists this species as a fish poison in India. Gater(18) states that this plant is common piscicide in Malaya.

The method used by the Malays in sea-fishing is described by Wray(69) as follows: The root is pounded or ground fine and mixed with stiff clay and crushed refuse, shrimps or small fish, and the mixture is then made into balls and dried. These balls are thrown into the sea, like ground-bait, and fish eating them become poisoned, rise to the surface, and are caught by the fishermen. In using "tuba," he continues, in rivers and fresh water generally the more usual practice is to pound the roots in water in some form of receptacle, sometimes half-filled canoe, and then empty this at the top of an enclosed portion of the river or stream. Sometimes lime is added after pounding in order to make the milky fluid sink and spread more rapidly when poured into the river. Skeat and Blagden(59) reports that the method of fishing, considered the most effective by the Sakais of Selangor and other Malay pagan tribes, consists in temporarily poisoning small streams and rivers by the use of the sap of the pounded roots of *Derris elliptica*. Ridley(53) states that the plant is often cultivated in Malay Peninsula as a fish poison.

DERRIS PHILIPPINENSIS Merr.

Derris multiflora Benth. var. ? *longifolia* Benth.

Derris multiflora Vidal

Local name: *Upi* (Ig.).

This is an endemic species reported from Luzon in the following provinces: Cagayan, Ilocos Norte, Benguet, Rizal, Laguna, Bataan, Tayabas and Camarines, as growing in thickets and forests, at low and medium altitudes.

Brown(8) reports that the roots of this plant are used as a fish poison in the Philippines.

DERRIS POLYANTHA Perk.

Local names: *Timalang* (Tag.); *tuglí* (Tag.); *tuglón* (Tag.); *tuglún* (Tag.).

This is an endemic species reported from Pampanga, Pangasinan, Laguna, and Batangas Provinces in Luzon, as growing in thickets and secondary forests at low altitudes.

Bacon(1) reports this plant as a fish poison containing a poisonous alkaloid.

Villadolid and Sulit(64) give the following account of the use of this plant as a fish poison. The roots are pounded and then scattered in a pool of water. The procedure is repeated as many times as is deemed necessary in order to extract as much as possible the juice present in the roots. It has been found by experience that a bundle of roots 50 centimeters long and 10 to 15 centimeters in diameter when thoroughly pounded will be sufficient to treat a pool one meter deep and about 10 meters wide. It is said to be more effective in salt water than in fresh water. The poison is found to take effect almost immediately after application.

DERRIS SCANDENS (Roxb.) Benth.

Dalbergia scandens Roxb.

Galedupa frutescens Blanco

Deguelia timoriensis Taub.

Local names: *Lapak* (Bik.); *malasága* (Tag.).

This species is common in thickets and secondary forests at low and medium altitudes, throughout the Philippines. It is also found in India to southern China through Malaya and tropical Australia.

Despite the abundance of the plant in the Philippines, it has not been reported as being used for poisoning fish. Chopra(12) lists this species as a fish poison in India.

DERRIS TRIFOLIATA Lour.

Dymock, Warden, and Hooper(14) state that a proximate analysis of the bark revealed the presence of two resins and an acrid glucoside allied to saponin. According to Pammel(45) the poisonous principle is derrin.

Burkill(10) quotes Blume (1825), who mentions this plant as a fish poison. This was confirmed by an ichthyologist, Bleeker, in 1858. Kalaw and Sacay(33) report this vine as poisonous and useful as an insecticide and as a fish poison. While

Brown(8) mentions this plant as a fish poison, he believes it to be poor insecticide. Chopra(12) includes this species also as a fish poison in India. Roth(54) describes the method in preparing this plant as a fish poison in Cooktown, Queensland, as follows: The stems are hammered on a stone or log, put into bundles and roasted, and finally thrown into the water which it renders more or less soupy. In Tully River the leaves are rather employed, especially for eels.

According to Hamlyn-Harris and Smith(26) *Derris uliginosa*, a synonym of this species, is one of the most effective and rapid fish poisons in Queensland. They say that on the O'Connell River, the plant is disintegrated, placed in nets, and infused into the water of small lagoons. The method used is as follows: The vine is cut up into two-foot lengths, sticks about a finger's thickness being preferred. These are beaten and bruised and handfulls therefore taken and thrown into the water, where they are again beaten and worked out. Fish quickly stupefy, and rising to the surface, are easily caught or speared.

ENTADA PHASEOLOIDES (Linn.) Merr.

Lens phaseoloides Linn.

Mimosa entada Linn.

Entada scandens Benth.

Adenanthera gogo Blanco

Entada pursaetha DC.

Mimosa Blancoana Llanos

Local names: *Balúgo* (Tag., Pamp.); *barúgo* (S. L. Bis.); *bayógo* (C. Bis., Tag.); *balónos* (Bis.); *dípai* (Ig.); *gógong-bákai* (Pamp.); *gógo* (Tag., Bik., Tagb., P. Bis.); *gúgo* (Tag.); *gúgu* (Tag.); *késsing* (Ibn.); *lipai* (Ilk.); *tamayan* (Bag.).

Gógo is pantropic in distribution. It is common in forests at low and medium altitudes throughout the Philippines.

The common gógo, according to Bacon,(1) is one of the plants used in the Philippines as a fish poison, and it owes its efficacy to its saponin content. A saponin solution of 1 to 20,000 was prepared by him, and three small fish placed in it. The fish soon became stupefied, floating about without motion on the surface of the water, and all died within two or three hours. The fish poison is usually prepared with considerable ceremony by the headmen of a village, the various ingredients being pounded together and then thrown into the stream or pool. The plants are often mixed with earth and rocks, the intention being to sink the noxious plants so that all parts of the water may be poisoned. Very soon small fish begin to float on their sides

on the surface of the water, while the larger ones move about slowly in a stupefied and helpless manner. The natives then rush into the water and kill and catch all they can. Bacon isolated saponin, which gives a crystalline sapogenin.

Kalaw and Sacay⁽³³⁾ report that the bark and leaves are crushed and put in ponds and streams to poison fish. Chopra⁽¹²⁾ lists this plant as a fish poison in India. Watt and Breyer-Brandwijk⁽⁶⁷⁾ record this plant as a fish poison in South Africa.

MILLETTIA MERRILLII Perk.

Millettia xylocarpa Naves

Millettia caerulea F.-Vill.

Local names: *Balók* (Tag.); *balok-balók* (Tag.); *bani* (Ilk., Pamp.); *malabai* (Pamp.); *paṅgardisen* (Ilk.).

This is an endemic species reported from Cagayan to Bataan and Rizal Provinces in Luzon, Mindoro, and Negros, growing in thickets and secondary forests, at low and medium altitudes.

The bark, roots, and leaves of this plant are used by fishermen particularly of Batangas and Bataan Provinces as fish poison. These parts are pounded and thrown into the water. The poison is considered powerful. The parts herein mentioned contain considerable amount of saponin.

PITHECOLOBIUM ELLIPTICUM (Blume) Hassk.

Inga elliptica Blume

Pithecolobium fasciculatum Benth.

Local names:: *Bugas* (P. Bis.); *salangkógi* (C. Bis.); *tabid-tabid* (Sul.).

The distribution in the Philippines of this species is limited only to Palawan, Panay, Negros, and Mindanao. It is also found in Malay Peninsula and Archipelago.

The bark is sometimes gathered and pounded and thrown into the water to poison fish in certain localities in Mindanao. Whether it is a saponin or a tannin responsible for the poison could not be ascertained. Burkill,⁽¹⁰⁾ quoting Heyne,⁽²⁹⁾ says that the bark is used in Java as a fish poison.

PONGAMIA PINNATA (Linn.) Merr.

Cytisus pinnatus Linn.

Robinia mitis Linn.

Galedupa indica Lam.

Dalbergia arborea Willd.

Pongamia glabra Vent.

Galedupa maculata Blanco

Pongamia mitis Merr.

Galedupa pinnata Taub.

Caju pinnatum O. Kuntze

Pterocarpus flavus Lour.

Local names: *Bagnéi* (Ibn.); *balikbálik* (Tag.); *balubalu* (Sul.); *bálok* (Tag.); *balok-bálok* (Tag., Bik.); *balu-bálu* (Yak.); *baluk-báluk* (C. Bis.); *balotbalot* (Tag.); *balutbalut* (Mag.); *bani* (Tag., Ilk., Sbl., Pamp.); *banit* (Tag.); *baobáo* (Mbo.); *bayog-báyok* (Tag., C. Bis.); *bayok-báyok* (C. Bis.); *butong* (Bis.); *kadel* (Tag.); *magit* (Mag.); *malok-balok* (P. Bis.); *marok-bárok* (Bik., S. L. Bis.); *maruk-báruk* (C. Bis.); *marobáhai* (Tagb.).

This is a common species reported throughout the Philippines, along the seashore, and near borders of lakes. It is also reported from Mascarene Island, tropical Asia, across Malaya to Australia and Polynesia.

Dymock, Warden, and Hooper(14) report that the bark contains a bitter alkaloid, also an acid resin. The seeds have bitter taste and their bitter principle appears to reside in a resin and not in an alkaloid.

The bark and the seeds are used as a fish poison in many localities in the Philippines. It has been also reported elsewhere as a useful plant for poisoning fish. Burkill(10) reports that the seeds are said to kill fish. Fishing by this means is reported also from Australia and Madeira. The roots are said to be more potent, are roasted, pounded and thrown into the water to be fished. It is also recorded as a fish poison in Australia by Howes.(31)

TEPHROSIA CANDIDA (Roxb.) DC.

This species has been introduced recently into the Philippines as a cover crop. We have no knowledge of its use in the Philippines as a fish poison. However, in Africa Howes(31) reports that the genus *Tephrosia* figures conspicuously among African fish-poison plants. The toxic properties of various species have been investigated, and tephrosin has been isolated. Gamble(17) records this species as a fish poison in eastern Bengal and Burma, the bark and the leaves being chiefly used.

ERYTHROXYLACEÆ

ERYTHROXYLUM CUNEATUM (Wall.) Kurz.

Ficus cuneata Wall.

Urostigma ? cuneatum Miq.

Erythroxylum burmanicum Griff.

Local names: *Baransiágau* (Ilk.); *manambo* (Bik.); *sáleng* (Tag.); *salñgen* (Ilk.).

The species has been reported from the following provinces of Luzon: Ilocos Norte, Ilocos Sur, Bulacan, Rizal, and Camarines, growing in secondary forests, especially on limestone formations at low and medium altitudes. It is also reported from Tenasserim, Malay Peninsula, Sumatra, and Java.

According to Kalaw and Sacay⁽³³⁾ the plant is used as a fish poison in Bulacan Province.

RUTACEÆ

ÆGLE MARMELOS Correa.

Local names: *Bael*, *Bengal quince*, *bhel*, *elephant's apple*, *maredoo* (Engl.).

Bael has been recently introduced into the Philippines, and cultivated for its edible fruits.

Chopra⁽¹²⁾ states that bael contains a bitter principle and a balsamic principle resembling Balsam of Peru.

Heyne⁽²⁹⁾ states that the bark is used in Celebes to make a fish poison.

ZANTHOXYLUM TORVUM F.-Muell.

Zanthoxylum glandulosum T. & B.

Fagara torva Eugl.

Fagara Warburghii Perk.

Local name: *Kayatana* (Tag.).

Zanthoxylum torvum is found in Tayabas and Isabela Provinces in Luzon, and in Leyte and Mindanao, in forests and thickets at low and medium altitudes. It is also reported from Java, Moluccas, and tropical Australia.

In the Philippines the vine is pounded thoroughly and inserted in the holes. It poisons eels and mudfish (*dalag*).

MELIACEÆ

DYSOXYLUM DECANDRUM (Blanco) Merr.

Turraea decandra Blanco

Turraea virens Blanco

Dysoxylum amooroides Miq.

Dysoxylum Blancoi Vidal

Dysoxylum salutare F.-Vill.

Local names: *Agáru* (Pang.); *agúru* (Pamp.); *ananang-tang* (Bik.); *bakúgan* (Bik.); *bundágon* (Bik.); *buntóg* (Bik.); *buntógan* (Bik.); *bongliu* (Bik.); *basiloág* (Ilk.); *bolong-tambang* (Bik.); *ikuo* (Tag.); *igiu* (Tag., Pamp.); *hugiug* (Tag.); *malaaduas* (P. Bis.); *manangtang* (Bik.); *malabangau* (Pamp.); *makasisi* (Bik.); *malabaga* (Pamp.); *palo-nambo-bokag* (Bik.); *paluahan* (P. Bis.); *pamatágin* (Ibn.); *pasiloág* (Ilk.); *tdiang-kalabáu* (Tag.); *tauing-tauing* (Mbo.); *taliktan* (Tag., Pamp.).

A common species in thickets and forests at low altitudes throughout the Philippines. It is also reported from Java to New Guinea.

According to Kalaw and Sacay(33) the plant is a common fish poison in Batangas Province.

MELIA AZEDARACH Linn.

Paraiso is cultivated in larger towns for its fragrant flowers, but nowhere naturalized. It was introduced from China.

Watt and Breyer-Brandwijk(67) record that from the bark a bitter substance, which is either a neutral principle or an alkaloid, was isolated.

We have no information that the plant is used as a fish poison in the Philippines. According to Standley(60) the bark is said to be used in some regions of Mexico for stupefying fish.

EUPHORBIACEÆ

ALCHORNEA PARVIFLORA (Benth.) Muell.-Arg.

Stipellaria parviflora Benth.

Acalypha tiliacfolia Vidal

Alchornea tiliacfolia Ceron

Alchornea sicca Pax & Hoffm.

This endemic species has been reported from Bulacan and Rizal Provinces in Luzon, Palawan, Leyte, and Negros, as growing in thickets and secondary forests, at low and medium altitudes.

In Bulacan Province it is said that all parts of the plant are used as a fish poison. These are pounded and then thrown into the water. All parts contain saponin.

ALCHORNEA SICCA (Blanco) Merr.

Excoecaria sicca Blanco

Croton drupaceum Blanco

Alchornea mollis F.-Vill.

Alchornea philippinensis Pax & K. Hoffm.

Local name: *Balánti* (Tag.).

The species is endemic in the Philippines, having been reported from Pangasinan, Pampanga, Rizal, and Laguna Provinces, and even in Manila, growing in thickets along small streams, at low altitudes.

According to Brown(8) the leaves and fruits are used for poisoning fish. Kalaw and Sacay(33) also report the use of the leaves and fruits for poisoning fish. Hydrocyanic acid is pre-

sent in the leaves; absent in the bark and roots; saponin is present in all parts of the plant.

CROTON TIGLIUM Linn.

Croton camaza Perr.

Croton glandulosum Blanco

Croton muricatum Blanco

Tigllium officinale Klotz.

Local names: *Gasi* (Sul.); *kamágsa* (Bik.); *kamaísa* (Tag.); *kamandag* (Bis.); *kamausa* (Tag.); *kásla* (Sul.); *lutung-sira* (Bik.); *makaísa* (Tag.); *makásla* (P. Bis.); *malapai* (Sul.); *salígau* (Ilk., Ibn.); *túba* (Ilk., Bik., Tag., S. L. Bis.); *tuba-túba* (Bik., P. Bis.); *tubang-kamaísa* (Tag.); *tubang-makaísa* (Bik., Tag.); *tubang-pasiti* (Bik.); *túbli* (C. Bis.); *túkbú* (If.).

This species is of prehistoric introduction from Malaya. It is common throughout the Philippines in and about towns, usually planted, sometimes naturalized. It is also reported from India to New Guinea. It is universally used for poisoning fish.

Tavera⁽⁶³⁾ first reported the use of the fruits by Filipinos to intoxicate fish in slow-running streams and in pools. According to Bacon⁽¹⁾ the fruit is one of the favorite fish poisons used in the Philippines. He reports that the fruits contain the very poisonous toxalbumin, crotin, which is similar to the well-known ricin and abrin. Persons who eat fish poisoned with this plant were not disturbed, although it is considered dangerous to drink water which contains any quantity of it.

Brown⁽⁸⁾ reports that the crushed leaves are used for poisoning fish. Guerrero⁽²⁵⁾ also mentions this plant as a fish poison. Kalaw and Sacay⁽³³⁾ state that the plant has no use except as a fish poison, for which purpose the leaves are used. Howes⁽³¹⁾ says that this species is used as a fish poison in Celebes. The plant is used as follows: The fruits are ground with strong-smelling root of an aroid, *Homalonema rubra* Hassk., and scattered upon the surface of the water. Gimlette⁽¹⁹⁾ records that the pounded ripe fruits of this plant are used by the natives of Java and Dyaks of Borneo to poison fish.

EUPHORBIA NERIIFOLIA Linn.

Euphorbia ligularia Roxb.

Euphorbia pentagona Blanco

Euphorbia trigona Merr.

Local names: *Bait* (Pamp., Tag.); *karimbuáya* (Ilk.); *lengua de perro* (Sp.); *soro-sóro* (Tag.); *sorog-sórog* (Pamp., Tag.); *sudusúdu* (P. Bis.).

The plant is cultivated in gardens in Manila and in some large towns; doubtless an introduced species. It has been re-

ported also from India to Malaya, probably introduced in the latter region.

Nadkarni⁽⁴²⁾ reports that the following constituents were isolated from the milky sap: euphorbon, resin, gum, cautchouc, calcium of malate, etc.

The Igorots use the bark and the leaves to poison fish. According to Kalaw and Sacay⁽³³⁾ this species is one of the commonest fish poisons, the leaves being employed for the purpose.

EUPHORBIA TIRUCALLI Linn.

Local names: *Bali-bali* (P. Bis.); *consuelda* (Sp.); *katuit* (Tag.); *kon-suérda* (Tag.); *gaton* (Ig.); *putputud* (Ig.); *solda-solda* (C. Bis.); *suelda-con-suelda* (Bik.); *suérda* (Tag.).

This is an introduced species in the Philippines; a native of Africa, now planted in most tropical countries. It is occasionally planted here in gardens, but apparently nowhere spontaneous.

According to Henke⁽²⁸⁾ euphorbon was isolated in handsome needles, together with 4 per cent cautchouc, from the milky sap.

It is known that the plant is being used in the Philippines as a fish poison. Chopra,⁽¹²⁾ however, lists this species as a fish poison in India. Greshoff,⁽²²⁾ quoting Doctor Boa, says that the milky juice is used for poisoning fish in Goa.

EUPHORBIA TRIGONA Haw.

Local names: *Suda-súda* (P. Bis.); *túba* (Bon.).

The plant is rather common throughout the Philippines, in thickets and on limestone cliffs, usually along the seashore. It is also reported from India to Malaya.

Henke⁽²⁸⁾ isolated from the milky sap 35 per cent euphorbon.

The bark is pounded first, and then thrown into the water to stupefy fish. The catch is made when the fish float on the surface. Heyne⁽²⁹⁾ quotes Boorsma, who states that the latex is poisonous, but the plant is much less poisonous than its close allies, and only stupefies fish after long contact.

EXCOECARIA AGALLOCHA Linn.

The bark is the part of the plant used in poisoning fish. This is pounded and thrown into the water. Kalaw and Sacay⁽³³⁾ also report that the leaves and stem of this plant are used as a poison in New Caledonia.

FLUGGEA VIROSA (Roxb.) Baill.

- Phyllanthus virosus* Roxb.
- Xylophylla obovata* Willd.
- Fluggea obovata* Wall. ex F.-Vill.
- Fluggea microcarpa* Blume
- Cicca pentandra* Blanco
- Securinega microcarpa* Muell.-Arg.
- Securinega obovata* Muell.-Arg.
- Fluggea leucopyrus* F.-Vill.
- Securinega ovata* Vidal

Local names: *Arusit* (Ilk.); *barasiksik* (Ilk.); *barsit* (Ig.); *barsik* (Ilk.); *barusik* (Ilk.); *bayasit* (Tag.); *boiset* (Tag.); *botolan* (Tag.); *bugbugutut* (Ig.); *kabukabukas* (Mag.); *magaspáng* (P. Bis.); *máluuit* (Ibn.); *tulitañgalong* (P. Bis.).

This species is common throughout the Philippines in dry thickets, at low and medium altitudes. It is also reported from tropical Africa through India to China and Malaya to tropical Australia.

According to Kirtikar and Basu⁽³⁵⁾ the bark contains 10 per cent tannic acid and an alkaloid.

Brown⁽⁸⁾ reports that the bark is used to poison fish. Chopra⁽¹²⁾ also mentions the plant as a fish poison in India.

HOMALANTHUS FASTUOSUS (Linden) F.-Vill.

- Mappa fastuosa* Linden
- Dibrachion fastuosum* Regel.
- Carumbium fastuosum* Muell.-Arg.

Local names: *Balánti* (Ilk., Tag., Bis.); *bóta* (Tag.); *bota-bóta* (Tag.); *botinag* (Ig.); *bubúta* (Ig.); *búta* (Tag.); *buta-búta* (Tag., Ig.); *put-púta* (Ig.); *tanugtug* (Iv.).

The species is common in thickets, old clearings, etc., mostly above an altitude of 750 meters, ascending to 2,000 meters. It is endemic in the islands, and has been reported from Batan Islands, Luzon (Abra, Bontoc, Lepanto, Benguet, Nueva Vizcaya, Tayabas, Laguna, Rizal, Sorsogon); Mindoro; Catanduanes; Panay; and Mindanao (Lanao).

Brown⁽⁸⁾ reports that the leaves of this plant are used for poisoning fish. Kalaw and Sacay⁽³³⁾ also mention this plant as a fish poison; and they state that the leaves are crushed and placed in streams. Saponin is present in all parts.

JATROPHA CURCAS Linn.

The latex from the bark is used to stupefy fish. This is done by pounding the bark and thrown into the water. Kalaw and Sacay⁽³³⁾ add also that the whole leaves and stems are poisonous to fish.

JATROPHA MULTIFIDA Linn.*Jatropha janipha* BlancoLocal names: *Maná* (Sp.); *tubang-amerikáno* (Bik.).

The species is introduced from tropical America. It is planted as an ornamental in Manila and large towns.

Wehmer(68) records that the seeds contain a bitter principle; the leaves with saponin; and the bark with a very toxic alkaloid, jatrophin.

Brown(8) lists this plant as a fish poison in the Philippines.

MALLOTUS PHILIPPENSIS (Lam.) Muell.-Arg.*Croton philippense* Lam.*Echinus philippinensis* Baill.*Rottlera philippinensis* Scheff.*Rottleria manilensis* Klotz. ex Pax & Hoffm.

Local names: *Apúyot* (Sul.); *banató* (Ibn., Ig., Tag.); *buás* (Ilk.); *darandáng* (Tag.); *panagisen* (Ibn.); *panagisian* (Neg.); *panagisien* (Ibn., Klg.); *pangaplasin* (Ilk.); *pikal* (Sbl.); *sala* (Tag., Bis.); *tafú* (Ibn.); *tagusála* (P. Bis.); *tutúla* (Tagb.).

Banató is common in thickets and second-growth forests at low altitudes, throughout the Philippines. It is also reported from India to southern China and Formosa, southward to New South Wales.

Wehmer(68) records that kamala resin contains the yellow rottlerin, also mallotoxin and kamalin.

The plant is well known here for its dye. In the Malay Peninsula, India, and Burma it is also known as a dye and a medicinal plant. It is not known as a fish poison in the Philippines. Bartlett(4) calls attention to the use in Sumatra of the name "tuba" for it, as if it were used there as a fish poison.

PHYLLANTHUS NIRURI Linn.*Phyllanthus carolinianus* Blanco*Phyllanthus kirganelia* Blanco? *Kirganelia pumila* Blanco? *Phyllanthus pumilus* Muell.-Arg.

Local names: *Kurukalunggái* (Bik.); *malakirumkirum* (S. L. Bis.); *ngingihel* (If.); *sampasampalúkan* (Tag.); *San Pedro* (P. Bis.); *surusampálok* (Bik.); *talikód* (Ilk.); *taltalikod* (Ilk.); *turutalikod* (Bik.).

This is a common weed throughout the Philippines. It is pantropic in distribution, but probably introduced into the New World.

Dymock, Warden, and Hooper⁽¹⁴⁾ quote Ottow⁸ who isolated the bitter principle, phyllantin.

According to Burkill⁽¹⁰⁾ the bitter substance is said to poison fish in Malaya. Kalaw and Sacay⁽³³⁾ say that saponin is present in the stem. It acts as a fish poison.

MISCELLANEOUS EUPHORBIACEÆ

According to Howes⁽³¹⁾ a large number of other euphorbiaceous plants belonging to genera *Securinega*, *Macaranga*, and *Sapium* are used as a fish poison in Asia.

BUXACEÆ

BUXUS ROLFEI Vidal.

Local names: *Malagaápi* (Tag.); *piukbanau* (Tag.); *sarapuyan* (Neg.); *yarang-yarang* (Neg.).

This is an endemic species reported from Bataan, Rizal, Pampanga, and Tayabas Provinces in Luzon; Sibuyan; Palawan; and Surigao Province in Mindanao, growing in primary forests, at low and medium altitudes.

According to Brown⁽⁸⁾ the fruits of this plant are dried and finely cut, and then scattered on water as a fish poison.

SAPINDACEÆ

DODONAEA VISCOSA (Linn.) Jacq.

Ptelea viscosa Linn.

Dodonaea angustifolia Linn.

Local names: *Dumánai* (Ig.); *haguiui* (Tag.); *kalapínai* (Tag.); *kasirag* (Sbl.); *lugad* (Kuy.); *tabau* (Tag.); *takud* (C. Bis.); *tubu-tubu* (C. Bis.); *sagása* (P. Bis., C. Bis.).

A pantropic weed rather common throughout the Philippines, along the seashore, in regions subject to a pronounced dry season, extending inland and ascending to 2,000 meters.

Burkill⁽¹⁰⁾ quotes Ghose⁹ who found an alkaloid, a glucoside, and resins as well as tanning in the leaves. Wehmer⁽⁶⁸⁾ quotes Greshoff¹⁰ who reported the presence of saponin.

Watt and Breyer-Brandwijk⁽⁶⁷⁾ quote Pammel who says that this plant is used as a fish poison. While the species is rather common in the Philippines, it is not recorded as a fish poison.

⁸ Mederl. Tijdschr. Pharm. 3 (1891) 126, 160.

⁹ Ind. Forester 59 (1933) 78.

¹⁰ Apoth.-Ztg. (1893) 589.

GANOPHYLLUM FALCATUM Blume.*Ganophyllum obliquum* Merr.

Local names: *Arañgan* (Ilk.); *arañgin* (Ilk.); *bagusalai* (C. Bis.); *gógo* (Ilk., Ibn.); *gogolíñgin* (Pamp.); *gugo* (Tag., P. Bis.); *guguláñgin* (Pamp.); *gogoñglángil* (Tag.); *halas* (P. Bis.); *lángin* (Tag.); *odo* (Tag.); *palumpung* (Tag.); *panda-panda* (Tag.); *pararan* (Bag.); *salñgen* (Ilk.); *tahuyai* (P. Bis.); *tugabi* (Tag.); *tulibas* (Tag.).

This is a common species in dry forests, at low and medium altitudes, throughout the Philippines. It is also reported from Andaman Islands, Java, New Guinea, and northern Australia.

Bacon⁽¹⁾ reports this plant as another fish poison containing saponin. The bark contains no alkaloids, a considerable amount of resin, and 7.2 per cent of saponin. The physiological behavior of saponin from this plant is very interesting, it being more irritating than the one from *Entada phaseoloides*. The action of this saponin on fish is apparently the same as that of the one from *Entada phaseoloides*. These saponins are particularly advantageous as fish poisons, because no harm will come from eating the fish. Kalaw and Sacay⁽³³⁾ also mention this plant as a fish poison.

HARPULLIA ARBOREA (Blanco) Radlk.*Ptelea arborea* Blanco*Seringia lanceolata* Blanco*Blancoa arborea* Blume*Harpullia Blancoi* F.-Vill.*Harpullia cupanioides* F.-Vill.*Harpulia imbricata* Thwaites

Local names: *Abúyan* (Ilk.); *ambuyoán* (Ilk.); *antatúba* (Neg.); *bogna* (Bag.); *dalirugái* (Ibn.); *dulio* (Sml.); *dulía* (Mag., Mbo.); *huás* (P. Bis.); *kayaskas* (Ilk.); *magalad* (Tagb.); *magalat* (Bik.); *magantimus* (Mag.); *malatúbas* (Bik.); *maramblág* (Ibn.); *mama-an* (Tagb.); *oás* (Ibn., Ilk., Tag.); *uás-na-puráu* (Ilk.).

This species is common in thickets and secondary forests, at low and medium altitudes, throughout the Philippines. It is also reported from India through Malaya to the Solomon Islands.

Greshoff⁽²²⁾ reports the presence of saponin.

According to Brown⁽⁸⁾ the bark of this plant is chopped fine and put in fresh-water streams to kill fish. Guerrero⁽²⁵⁾ states that the bark contains an active substance which stupefies and kills fish. Saponin is said to be present in the leaves, bark, and roots.

SAPINDUS SAPONARIA Linn.*Quassia tricarpa* Blanco*Sapindus Forsythii* Turcz.*Sapindus Turczaninowii* Vidal

Local names: *Amugáen* (Ilk.); *kasibag* (Ilk.); *kasábai* (Ilk.); *katíkis* (Tag.); *katigis* (Tag.); *kasiben* (Ilk.); *kasibeng* (Ibn., Ilk.); *kusibeng* (Ilk.); *malahito* (Tag.); *malapalitpit* (Pamp.); *palikpik-hitó* (Tag.); *tika-tiká* (Tag.); *tikas-tikás* (Tag.); *tikis-tíkis* (Tag.).

The species is locally common in secondary forests, at low and medium altitudes. It has been reported from the following provinces of Luzon: Cagayan, Ilocos Norte, Ilocos Sur, Abra, La Union, Pangasinan, Nueva Ecija, Zambales, Pampanga, Batangas, Rizal, and Laguna; and Cotabato Province in Mindanao. It is pantropic in distribution.

The seeds when pounded and thrown into streams cause death of fish. The bark has also been used and is reported to contain saponin. Macfadyen(38) reports that, bruised or pounded, and thrown into ponds of water, the bark intoxicates and kills any fish that may be found there. It is said that the fruit is used in Mexico(60) also for stupefying fish. The fruits contain as much as 37 per cent saponin.

RHAMNACEÆ**COLUBRINA ASIATICA** (Linn.) Brongn.*Ceanothus asiatica* Linn.*Rhamnus carolinianus* Blanco

Local names: *Kabatiti* (Tag.); *kayaskás* (Ilk.); *paria* (Bag.); *palialaut* (Sul.); *parid-lalud* (Sul.); *uatitik* (Tag., Bis.).

This species grows along the seashore and borders of tidal streams, throughout the Philippines. It is also reported from India to Africa, through Malaya to Australia and Polynesia.

According to Heyne(29) the bark contains saponin.

The fruits are used as fish poison.(25)

ZIZYPHUS JUJUBA (Linn.) Lam.*Rhamnus jujuba* Linn.*Zizyphus mauritiana* Lam.

Local names: *Manzanas*, *manzanitas* (Sp.).

The manzanas, or manzanitas, as is universally known in the Philippines, is introduced from tropical Asia. It is widely scattered in cultivation and scarcely naturalized here.

According to Nadkarni(42) the bark contains much tannin, and a crystallizable principle, ziziphic acid.

Howes(31) reports that this species is a reputable fish poison. We have no record in the Philippines of its use as a fish poison.

MALVACEÆ

THESPIA POPULNEA (Linn.) Soland.

Hibiscus populneus Linn.

Thespesia macrophylla Blume

Thespesia banalo Blanco

Local names: *Balu* (Sul.); *banág* (Kuy.); *banágo* (Tag., P. Bis.); *banágo-pulá* (Tag.); *banálo* (Tag.); *banáro* (Pang.); *baót* (Sul.); *iden* (Ting.); *tuba-túba* (Bik.); *válo* (Iv.).

While this species is common throughout the Philippines along the seashore, it has not been reported as a fish poison. The plant is pantropic in distribution.

Hamlyn-Harris and Smith(26) report that the plant is used as a fish poison, and that they have demonstrated its ability to cause stupefaction and death of fish at higher concentrations.

STERCULIACEÆ

KLEINHOVIA HOSPITA Linn.

Kleinhovia serrata Blanco

Grewia Meyeniana Walp.

Local names: *Apung-ápung* (Sul.); *balansi* (Mang.); *bantana* (C. Bis.); *bignon* (Ilk.); *biknong* (Ilk.); *biluan* (P. Bis.); *binong* (Ilk.); *bitanag* (C. Bis., Mbo.); *bitnong* (Ilk.); *bitnung* (Ilk.); *butnong* (Ilk.); *hunung* (Ilk.); *hamitanágo* (Bik.); *lapnis* (C. Bis.); *marakápas* (Ilk.); *pampas* (Ilk.); *panampat* (Pamp.); *táag* (Tag.); *tagnág* (Chab.); *tamanág* (Bag., Mag.); *tanág* (Tag., Bik., S. L. Bis.); *tanák* (Tag.); *tañgá* (Tag.); *toloktok* (Ilk.); *unapong* (Sul.).

A characteristic tree of thickets, second-growth forests, and deserted clearings, throughout the Philippines. It is also reported from India to tropical Africa and Malaya.

Brown(8) and Guerrero(25) report that in the Island of Marinduque the bark and leaves of this plant are used to poison eels.

PTEROSPERMUM DIVERSIFOLIUM Blume.

Pterospermum hastatum Blanco

Pterospermum acerifolium Rolfe

Local names: *Bagud* (Tag.); *bayóng* (Tag.); *báloi* (Ilk.); *balaibáyan* (Sbl.); *bároi* (Neg., Ilk.); *bayóg* (Tag., Bik., Pamp., P. Bis.); *barog-bayóg* (Chab.); *bayóng* (Tag.); *bayók* (Tag., Bik., P. Bis.); *bayúg* (Tag., Sul.); *bayúk* (Tag.); *dibual* (Yak.); *kabislak* (Sul.); *malibayo* (Tag.); *rayók* (Tagb.); *taliñgaun* (Sbl.).

This species is common in forests, at low and medium altitudes, throughout the Philippines. It is also reported from Indo-China, Malay Peninsula, Sumatra, Borneo, Java, and the Moluccas.

The bark of the root is said to act as a fish poison in Malaya.⁽¹⁰⁾

THEACEÆ

TERNSTROEMIA TOQUIAN (Blanco) F.-Vill.

Llanosia toquian Blanco

Ternstroemia penangiana Vidal

Ternstroemia lobbiana Pierrér

Taonabo toquian Merr.

Local names: *Bigag* (Tag.); *bikag* (Tag.); *boalau* (Mbo.); *debaak* (Ilk.); *garamansatai* (Tag.); *malapuyau* (Tag.); *sambinuluka* (Sbl.); *tabak* (Ilk.); *tokian* (Tag.).

This species is reported growing in primary forests at medium altitudes, in most provinces and islands of the Philippines. It is also known from Celebes.

According to Brown⁽⁸⁾ the fruits and the bark of this plant are used for poisoning fish.

GUTTIFERÆ

CALOPHYLLUM INOPHYLLUM Linn.

This species is a characteristic strand tree, common throughout the Philippines, along the seashore. It is also reported from India to tropical East Africa through Malaya to Polynesia.

Richmond and del Rosario⁽⁵¹⁾ report that the oil from the kernels contains a poisonous resin.

The leaves are used for poisoning fish. Both hydrocyanic acid and saponin have been found in the leaves, bark, and roots.⁽³³⁾

FLACOURTIACEÆ

PANGIUM EDULE Reinw.

It is said that the bark is used as a fish poison in certain localities in the Philippines. The poisonous active principle of this tree is hydrocyanic acid, which is contained in large quantities in the fruits, but unlike cassava, they are edible when properly cooked. The seeds from the young fruits are toxic and not edible. According to Gimlette⁽¹⁹⁾ the bark of this tree is used also as a fish poison in Malaya. Tavera⁽⁶³⁾ mentions that on account of the narcotic properties of the plant, in Java the bark is used to intoxicate fish.

LECYTHIDACEÆ

BARRINGTONIA ACUTANGULA (Linn.) Gaertn.*Eugenia acutangula* Linn.*Botryoropsis luzonensis* Presl*Strayadium luzonense* Miers.*Barringtonia luzonensis* Rolfe*Barringtonia reticulata* Miq.

Local names: *Apaling* (Ig.); *himbabalód* (P. Bis.); *kalambráya* (Ilk.); *latuba* (Ibn.); *pútad* (Tag.); *pútat* (Tag.); *pútat* (Tag., Pamp., Bik.); *sakó* (Mbo.); *sakú* (Mbo.); *topuk* (Mag.); *túba* (Tag., Ibn.).

This species is found growing in thickets and forests, at low and medium altitudes, from northern Luzon to Mindanao and Palawan, in most islands and provinces. It is also reported from India through Malaya to tropical Australia.

According to Nadkarni(42) the active principle is allied to saponin. Chopra(12) mentions the presence of glucoside-saponin, barringtonin.

According to Brown(8) the bark of this tree is used as fish poison. Howes(31) records the use of the pulpy fruits of this species as a fish poison. Chopra(12) lists this species as a fish poison in India. Watt(66) also mentions that the bark is used to stupefy fish in most parts of India.

BARRINGTONIA ASIATICA (Linn.) Kurz.*Mammea asiatica* Linn.*Barringtonia speciosa* Forst.*Agasta asiatica* Miers.*Butonica Rumphiana* Miers.

Local names: *Balubitóon* (P. Bis.); *bitón* (Bik.); *bitóon* (C. Bis.); *bitung* (Bis.); *botón* (Tag.); *botóng* (Tag., Bik.); *botong-bótong* (Bik.); *butón* (Bik., Chab.); *lugo* (Ibn.); *motong-bótong* (Bik.); *vutón* (Iv.).

This is a common tree growing along the seashore throughout the Philippines. It is also reported from tropical Asia to Polynesia.

Wehmer(68) records that the seeds contain a glucoside, barringtonin.

According to Villadolid and Sulit(64) the bark which is reddish grey is used for poisoning fish. A sufficient quantity of bark, preferably taken from a mature tree, is cut into small pieces, which are then cominuted and mixed with earth in a wooden mortar. The proportion is about one part of earth to three parts of bark. The quantity of bark to be used depends upon the size of the pond to be poisoned. The mixture is put in a gunny sac; a half-sacfull has been found by ex-

perience to be sufficiently strong to kill fish in a pond of about a meter deep and eight meters in diameter. The time of application of the fish poison has been found to be most satisfactory at early dawn; then by six o'clock in the morning the stunned fish may be collected from the pool thus treated.

Brown(8) reports also that the bark and fruits are used as fish poison. Guerrero(25) mentions that the fruits are employed to stupefy fish. Safford(56) reports the use of this plant in Guam for catching fish. He states that the fruits are pounded into a paste, inclosed in a bag, and kept overnight. The time of an especially low tide is selected, and bags of the pounded fruits are taken out on the reef the next morning and sunk in certain deep holes. The fish soon appear on the surface; and the natives scoop them in nets, spear them, or jump overboard and catch them with their hands, sometimes even diving for them. Watt(66) also mentions the plant as useful in India to stupefy fish without killing them.

BARRINGTONIA RACEMOSA (Linn.) Blume.

Eugenia racemosa Linn.

Menichea rosata Sonn.

Barringtonia stravadium Blanco

Butonica rosata Miers.

Local names: *Kasouai* (Mbo.); *kutkut-timbalon* (Sul.); *nuling* (C. Bis.); *paling* (Ibn.); *pótat* (Tag.); *pútad* (Tag.); *pútat* (Tag., Bik., S. L. Bis., P. Bis., Sul., Mag.); *tuba-túba* (C. Bis.).

This is a common species growing throughout the Philippines, in most or all islands and provinces, in thickets, damp places, along the seashore, streams, etc., at low altitudes. It also occurs in India to Malaya and Polynesia.

Burkill(10) reports that the bark contains tannin.

According to Brown(8) the bark of this plant is put in streams to poison fish. This species has also been reported to have been used by the natives of the Mitchell River, northern Queensland, as a fish poison, by Howes(31) and by Palmer.(44) They state that the bark is cut into small pieces and severely pounded between stones before being placed in the water. Roth(54) gives the following account of this species as a fish poison in northern Queensland. The bark is hammered between stones until it gets quite spongy, and then taken into the water, where it is rubbed with the hands. Fish are stupefied in about a quarter of an hour. Dymock, Warden, and Hooper(14) quote Ainslie, who states that in Java and Ternate the seeds are used for intoxicating fish.

ARALIACEÆ

POLYSCIAS NODOSA (Blume) Seem.*Aralia nodosa* Blume*Paratropia nodosa* DC.*Aralia umbraculifera* Roxb.*Aralia pendula* Blanco? *Polyscias acuminata* Vidal

Local names: *Bias-bias* (Tag., Bis.); *bingliu* (Tag., Bis.); *bonliu* (Tag.); *bundieu* (Ig.); *bungliu* (Tag.); *goyung-góyung* (Tag.); *hagdan-anak* (C. Bis.); *malápapáya* (Tag., Bis., Pang.); *mano-máno* (Yak.); *bungloi* (Bis.); *tukod-lañgit* (Tag., Pamp.).

This tree occurs in Benguet, Pangasinan, Zambales, Rizal, Bataan, Laguna, Tayabas, and Sorsogon Provinces in Luzon; Palawan; Leyte; Mindanao; and Basilan, in second-growth forests, at low and medium altitudes. It also occurs in Java to the Moluccas.

Wehmer (68) records that the leaves contain a toxic principle, a saponin (polyscias-saponin).

According to Kalaw and Sacay (33) the plant is a popular fish poison in the Philippines. The leaves contain saponin.

MYRSINACEÆ

ÆGICERAS CORNICULATUM (Linn.) Blanco.*Rhizophora corniculata* Linn.*Aegiceras majus* Gaertn.*Malaspinaea laurifolia* Presl*Aegiceras malaspinaea* A. DC.

Local names: *Batag-batag* (Sbl.); *bulali* (P. Bis.); *dumanai* (Ibn.); *kawilan* (C. Bis.); *kindug-kindug* (Tag.); *lamauas* (Bag.); *pilapil* (Tag.); *pipisik* (Tag.); *saging-ságing* (P. Bis., C. Bis., Tag.); *saging-sagiñgan* (Tag.); *sulásig* (Tag.); *tagisa* (Sul.); *tayókon* (C. Bis.); *tim-bambakis* (Tag.); *tindók* (Tag.); *tinduk-tindúk* (Sul.); *tundók* (Tag.); *tundok-tundók* (S. L. Bis.); *tunduk-tundukan* (Tag.); *tiñgan-bagis* (Tag.).

This species is common along the seashore and tidal streams on most or all islands. It is also reported from India to south-eastern China throughout Malaya to tropical Australia.

The bark is used as a fish poison. According to Burkill (10) the bark contains aegiceras-saponin.

MAESA CUMINGII Mez.*Maesa membranacea* A. DC.

Local names: *Katiput* (Tag.); *malalapi* (Sbl.); *patipol* (Tag.); *patipot* (Sbl., Tag.); *silunau* (Tag.).

This is an endemic species, common in thickets and forests, at low and medium altitudes, occurring in Abra, Bontoc, Ben-

guet, Pangasinan, Zambales, Nueva Ecija, Bulacan, Rizal, Bataan, Laguna, Tayabas, and Camarines Provinces, in Luzon; Mindoro; Palawan; Romblon, and Mindanao.

Brown(8) reports that the bark of this species is useful for poisoning fish. Burkill(10) also reports this species as poisonous to fish in Malaya. The poisonous action is due to saponin.

MAESA DENTICULATA Mez.

Maesa membranacea Blanco

Local names: *Burobalatong* (P. Bis.); *dagangdang* (Sul.); *kalikot* (Tag.); *katikot* (Tag.); *logut* (Tag.); *magutata* (Sul.); *malabulik* (Neg.); *malatotis* (S. L. Bis.); *nukud* (Tagb.); *ototai* (Ig.); *palang* (Tag.); *patipat* (Tag.); *saan-kabáyo* (Pamp.); *solinau* (Tag.); *tablong* (Sbl.).

This endemic species occurs in most or all islands and provinces at low and medium altitudes, ascending to 1,200 meters, in thickets, secondary forests, and in openings in primary forests.

According to Brown(8) the whole plant is used to stupefy fish, which are afterwards collected from the surface of the water. Bacon(1) records the presence of one of the saponin glucosides.

MAESA LAXA Mez.

Maesa indica A. DC.

Bassovia sylvatica Blanco

Maesa grossedentata Mez

Local names: *Bagumaomau* (Bik.); *kalapailapai* (Bik.); *malataiutes* (S. L. Bis.); *tablong* (Tag.); *tablonglong* (Tag.); *tagbaya* (Mang.); *tubang-aso* (Tag.).

This is another endemic species, common in secondary and also often in primary forests, at low and medium altitudes, practically throughout the Philippines.

The fruit of this plant is used to poison fish, according to Brown.(8)

EBENACEÆ

DIOSPYROS EBENASTER Retz.

Sapote negro Sonn.

Diospyros sapota Roxb.

Diospyros nigra Perr.

Sapota nigra Blanco

Diospyros nigra Blanco

Local names: *Sapote* (Tag.); *zapóte negro*, *zapote* (Sp.).

Sapote is occasionally planted in and about towns as an ornamental foliage tree and for its large edible fruits, and also as a shade tree. It is nowhere spontaneous in Isabel, Nueva Ecija, Bataan, and Rizal Provinces in Luzon, and in other provinces. It was introduced from Mexico during the early colonial period.

It is known here as a fish poison plant. Burkill,(10) however, reports that in the West Indies the unripe fruits were said to be pounded and thrown in water. The fish narcotized by this method might be caught.

DIOSPYROS MARITIMA Blume.

Cargillia laxa R. Br.

? *Diospyros biflora* Blanco

Local names: *Kalúmai* (S. L. Bis.); *kanómai* (Pang., Tag., Bik.); *kanómas* (P. Bis.); *kanúmai* (Ilk., Tag., Bik., Kuy., P. Bis., Chab.); *malatinta* (Pamp.); *marumangkái* (Tag.); *tauag* (Tagb.).

This species occurs in most or all islands and provinces at low altitude, often common in thickets and forests along the seashore, occurring also inland. It is also reported from Java to New Guinea, Samoa, and tropical Australia.

The fruits are crushed and mixed with gravel and thrown into water to poison fish.

DIOSPYROS MULTIFLORA Blanco.

According to Villadolid and Sulit(64) the fruit of this tree is used as fish poison. It may be prepared according to them as follows: Fruits, preferably collected at the time they are just showing indication of ripening, are pounded in a wooden mortar and mixed with a small quantity of soil. Care must be taken in handling the fruits as the juice is corrosive and may burn the skin. Experience has shown that a petroleum can of powdered fruits is sufficient to kill fish in a pool or pond about twenty square meters in area and about two or three meters deep. The application of the poison may be about six o'clock. This poison has been found to be more effective in fresh water than in salt water.

Bacon(1) reports this plant as a violent fish poison. It is reported by the natives that the fruits are exceedingly poisonous, and that they will quickly kill fish, and will even cause a crocodile to leave the water. He also maintains that the juice of the fruits when applied to the human skin blisters it and causes it to turn black. Bacon conducted experiments on the

toxicity of the fruits. He finds that a peculiar acid is present in the fruits, which seems to belong to the tannic acid series, and to which he provisionally assigns the irritating properties of the plant. Brown(8) states that the bark is used also for poisoning fish.

APOCYNACEÆ

CERBERA MANGHAS Linn.

According to Guerrero(25) the seeds are toxic, and are used in fishing in small streams. Burkill(10) reports also that in Malaya the seeds are poisonous to fish. Gimlette(19) adds that the plant is also used as a fish poison in Celebes.

KIBATALIA BLANCOI (Rolfe) Merr.

Kickxia Blancoi Rolfe
Kickxia arborea F.-Vill.
Kickxia Merrittii Merr.
Kickxia Macgregori Elm.

Local names: *Ayéte* (Mang.); *kagpaáyan* (Ilk.); *lanéti* (P. Bis.); *laníting-gúbat* (Tag.); *pasnit* (Ilk.).

This endemic species occurs in Cagayan, Ilocos Sur, Batangas, and Laguna Provinces in Luzon; Catanduanes, Mindoro, Sibuyan, Guimaras, Negros, and Leyte, in secondary and primary forests at low and medium altitudes.

The bark and leaves of this plant are used for killing fish.(8)

THEVETIA PERUVIANA (Pers.) Merr.

Cerbera peruviana Pers.
Cerbera thevetia Linn.
Thevetia neriifolia Juss. ex. Steud.

Common name: *Yellow oleander* (Engl.).

Yellow oleander is cultivated as an ornamental plant in the larger towns of the Philippines. It was introduced from tropical America, and now pantropic in distribution.

Chopra(12) records that the oil from the kernel contains a glucoside, thevetin.

The bark and leaves of this plant are used for killing fish.(8) Heyne(29) says that in Java the wood is reported used as a fish poison.

VOACANGA GLOBOSA (Blanco) Merr.

Tabernaemontana globosa Blanco
Voacanga Cumingiana Rolfe
Orchipeda foetida F.-Vill.

Local names: *Alibútbut-ñga-bai* (P. Bis.); *bayág-kambing* (Tag.); *bayág-usá* (Tag., Bik.); *galofag* (Gad.); *gañga* (Neg.); *itlóg-usá* (Tag., Bik.); *lapit-usá* (Bik.); *litá* (C. Bis.); *makabúnnga* (Bik.); *pandakáking*

kalabáu (Tag.); *pantog-sa-usá* (Bis.); *parip-usá* (Bik.); *talanísog* (P. Bis.).

This common endemic species is found throughout the Philippines, in secondary and primary forests, at low altitudes.

The pounded fruits are used to stupefy eels.(8)

ASCLEPIADACEÆ

ASCLEPIAS CURASSAVICA Linn.

Asclepias syriaca Blanco

Local names: *Anibung* (Bong.); *balihig* (If.); *bubúyan* (Tag.); *bulak-bulákan* (Tag.); *bulak-damo* (Tag.); *bulak-kastila* (Tag.); *bukitkit* (Tag.); *kapos de francia* (Pang.); *koronítas* (Bik.); *daldal* (Iv.); *kala-láuan* (Tag.); *kapol-kapol* (Tag.); *ligurias* (P. Bis.); *pasanglai* (Bon.); *punganen* (Iv.); *sabsabrong* (Ilk.).

This weed, now pantropic in distribution, is of American origin. It occurs throughout the Philippines in the settled areas, in open waste places in and about settlements, ascending to at least 1,500 meters.

Gram(21) has found the plant to contain an active principle of a glucosidal character, which he named asclepiadin.

While this plant is well known as medicinal in the Philippines, we have no information that it is being used for poisoning fish. According to Hamlyn-Harris and Smith(26) the adoption of this plant as a fish poison on the Don River in Queensland is comparatively recent.

VERBENACEÆ

CALLICARPA CANA Linn.

Callicarpa bicolor Schauer

Local names: *Alalui* (C. Bis.); *alayo-ti-manok* (Pang.); *anobrang* (Ilk.); *anuyup* (Ibn., Ilk.); *palis* (Tag.); *papalsis* (Tag.); *tambalási* (Tag.); *tambul-basi* (Sul.); *tígau* (Bis., Bik., Tag.); *tígau-na-itím* (Tag.); *túbang-dalág* (Tag.).

This species is found in most or all islands and provinces in the Philippines, growing in thickets and secondary forests, at low altitudes. It occurs also in Malay Peninsula and Archipelago to the Bismarck Archipelago, the Marianne, Caroline, and Palau Islands.

Villadolid and Sulit(64) give the following account of this plant as a fish poison: The leaves are used as fish poison. These are prepared as poison by pounding them with earth in a wooden mortar until they become powderlike in appearance. When the leaves become juicy, the mixture is ready for use. A ganta

of such mixture will be strong enough to stun and even kill the fish in a pool of about one meter deep and five meters wide. The poison may be applied any time of the day, but five o'clock or six o'clock in the morning is the usual time of application. The poison takes effect within an hour after application. Brown(8) also reports that the leaves of this plant are pounded and then used as fish poison.

CALLICARPA ERIOCHLONA Schauers.

Local names: *Kagong* (Bag.); *palis* (Tag.); *salingárau* (Neg.); *tambalabási* (Tag.); *tigau* (Tag., P. Bis.); *túbang-dalág* (Tag.).

The plant has been reported from Cagayan to Sorsogon in Luzon; Mindoro, Leyte, Negros, and Mindanao, as occurring in primary and secondary forests at low altitudes, often rather common. It also occurs in Borneo, Celebes, New Guinea, New Britain, and New Ireland.

According to Villadolid and Sulit(64) the plant is used as a fish poison. The method of preparing the poison and its application is similar to that of *Callicarpa cana*. Brown(8) also mentions the leaves of this plant as useful for poisoning fish.

CALLICARPA FORMOSANA Rolfe.

Callicarpa americana Blanco

Callicarpa attenuata Walp.

Callicarpa Blancoi Rolfe

Callicarpa ovata C. B. Rob.

Local names: *Anadhiu* (Ig.); *anoyop* (Ilk., Ibn.); *anoyot* (Ilk.); *atólba* (If.); *palis* (Tag.); *tambalabási* (Tag.); *tiagau* (Tag.); *tigau* (Tag., Bis., Bik.); *tigau-tigau* (C. Bis.); *tigbabási* (Bik.); *timbabási* (Tag.); *túbang-dalág* (Tag.); *tubaybási* (Tag.).

This is a common species occurring throughout the Philippines, in thickets and secondary forests, at low and medium altitudes. It also occurs in Formosa.

According to Villadolid and Sulit(64) the leaves of this plant are used as a fish poison. The methods used in preparing the poison and its application is similar to those of *Callicarpa cana*. Kalaw and Sacay(33) also report the use of this plant in poisoning fish. Saponin is present in the leaves, bark, and roots. Brown(8) and Guerrero(25) state that the leaves are pounded and used as fish poison.

VITEX PARVIFLORA Juss.

Vitex timoriensis Walp.

Vitex littoralis Decne.

Vitex altissima Blanco

Vitex geniculata Blanco

Vitex latifolia Blanco

Vitex cofassus Reinw. var. *pubescens* Hallier f.

Vitex cofassus Reinw. var. *pubescens* Hallier f.

Vitex glandulosa H. Lam

Local names: *Adgañon* (S. L. Bis.); *alah* (Bag.); *amaráun* (Bik., Bis.); *amañan* (Gad.); *amugañan* (Ibn.); *amulañon* (Mbo.); *anla* (Bag.); *bulañen* (Pang.); *burikán* (Bag.); *edieu* (Bon.); *hamolañen* (P. Bis.); *hamoráon* (Bik., S. L. Bis.); *hamulai* (Sul.); *hamulañon* (Sul.); *hamuráon* (Bik.); *hamúyan* (C. Bis.); *kuláh* (Bag.); *kalipápa* (Sub., Sul.); *kali-pápabató* (Sub., Mag.); *kulipápa* (Mag.); *kulimpápa* (Mag.); *malabalinanau* (Sbl.); *marauin* (Bis., P. Bis.); *maulauin-aso* (Kuy.); *molauin* (P. Bis., Chab., Tag.); *moláve* (Ilk., Sbl., Tag., Pamp., Bik., S. L. Bis., P. Bis., C. Bis., Lan.); *moláve-batú* (C. Bis., Sul.); *moláve de playa* (Sp.); *mulauin* (Pang., Tag., Sbl., Bik., Sul.); *muláon* (P. Bis.); *sagad* (Ilk.); *salingkápa* (Bis.); *murauin* (Bis.); *sagat* (Ilk., Ting.); *sasalit* (Mag.); *topas* (Bag.); *tugas* (P. Bis., C. Bis.); *tugas-abgaon* (S. L. Bis.); *tugas-lanhan* (Bis.); *taga* (Ibn.).

This valuable timber tree, commercially known as molave, is common in all or most islands and provinces throughout the Philippines, in both secondary and primary forests, at low altitudes. It also occurs in Saleyer, Timor, Java, Celebes, and Amboina.

The fruits are ground, and with the bark are used as a fish poison. Both hydrocyanic acid and saponin are present in the leaves, bark, and fruits. (33)

RUBIACEÆ

GARDENIA CURRANII Merr.

Randia aculeata Blanco

Local names: *Malarayap* (Tag.); *malasampága* (Tag.); *sinasampága* (Tag.).

This endemic species is reported only from Rizal, Pangasinan, Bataan, and Batangas Provinces in Luzon.

According to Villadolid and Sulit (64) the fruits are used as a fish poison. They describe the method of preparing the poison as follows: The ripe fruits are powdered with earth in a wooden mortar. About a petroleum can of the powdered fruit is effective in a pool about a meter deep and ten meters wide. The poison has been found to be more effective in fresh water than in salt water. The time of application, according to experienced users, is about five to six o'clock in the morning. The poison is said to take effect within an hour after application.

CUCURBITACEÆ

LUFFA CYLINDRICA (Linn.) Roem.

Momordica luffa Linn.*Momordica cylindrica* Linn.*Luffa petola* Seringe*Luffa aegyptiaca* Mill.

Local names: *Kabatíti* (Bon., Ilk.); *kabatitit-aso* (Ilk.); *patóla* (Bis., Big., Tag.); *patólang bilog* (Tag.); *potúlang-uák* (Tag.); *patúla-anu* (Sul.); *salag-salag* (Tag.); *tabau-tábau* (Ilk.); *tabóbok* (Tag.); *tabúbok* (Tag.).

Patólang bilog is commonly cultivated in the Philippines for its edible fruits. The wild forms have smaller fruits, and occur in thickets in the settled areas. It is pantropic in cultivation.

Peckolt(46) isolated from the fruits a bitter principle, a saponin.

The fruits of the wild form are not edible, as their juice is very bitter. We have no report that the fruits of the wild form had been used for poisoning fish. But Roth(54) and Palmer(44) report that in Mitchell, Gilbert, and Einasleigh Rivers, in Queensland, *Luffa aegyptiaca*, which is a synonym of the above species, is used to poison fish when green.

COMPOSITÆ

BLUMEA BALSAMIFERA (Linn.) DC.

Conyza balsamifera Linn.

Local names: *Alibun* (P. Bis.); *alimon* (P. Bis.); *ayoban* (Bis.); *bukadkad* (S. L. Bis.); *dalapot* (C. Bis.); *gabuen* (Bis.); *gintin-gintin* (Bis.); *gitin-gitin* (Bis.); *hamlibon* (Bis.); *kaliban* (Tagb.); *kalibura* (Tagb.); *labúlan* (Sub.); *lakadbúlan* (Big., Sul.); *lakákdan* (Bis.); *lakdan-búlan* (Bis.); *sambún* (Sul.); *sambóng* (Tag., Pamp.); *sobsob* (Ilk.); *sobosob* (Ig.); *subusub* (Ilk.); *takamáin* (Bag.).

This species is common in open grasslands at low and medium altitudes in all or most islands and provinces in the Philippines. It is also reported from India to southern China through Malaya to the Moluccas.

The leaves of this plant are used with other plants for poisoning fish. Their efficacy is questionable according to Brown.(8)

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A REVIEW OF PHILIPPINE STROMBIDÆ¹

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This paper presents a revision of the Family Strombidæ known or reported to occur in the Philippines. It is a continuation of the study of Philippine recent Mollusca. The procedure of the study and the arrangement of this paper are similar to those followed in a previous publication.² The material upon which this paper is based is largely in the collection of the Natural History Museum Division, Department of Agriculture and Commerce, Manila.

Family STROMBIDÆ D'Orbigny

Shell usually solid, imperforate, lip more or less dilated, sometimes digitated; aperture canaliculated, columella callous, devoid of plaits; opercle siliceous, generally unguiculate.

Eyes pedunculate or sessile; tentacles slender; proboscis contractile, annulate; siphon short, dentition tænioglossate. Foot slender and strong, enabling the animal to move in short jumps instead of by the smooth gliding motion common to most gastropods.

Key to the genera of Philippine Strombidæ.

- a*¹. Outer lip expanded, tubularly digitated *Pterocera*.
- a*². Outer lip more or less expanded, entire, sometimes slightly digitated.
 - b*¹. Lip usually dilated, margin entire; shell heavy, ovate, turreted.
Strombus.
 - b*². Shell fusiform, cancellated; anterior canal short, posterior canal rather long, closely applied to spire *Rostellaria*.
 - b*³. Shell elongate, subcylindrical, thin, lip simple *Seraphs*.

¹ This paper with 5 plates was originally submitted in 1941, but the war prevented its publication. The plates, unfortunately, were lost during the emergency.

² Alcasid, Godofredo L. Philippine Recent Shells. Phil. Jour. Sci. 61 (1936) 489-499, pls. 1, 2.

Genus **PTEROCERA** Lamarck

SAANG-LAKI (Cebu)

SCORPION SHELLS

Pterocera LAMARCK, Anim. sans Vert. 7 (1882) 194.

Shell ovate, spire turriculate; aperture narrow, elongate; lip broadly dilated, tubularly digitated; operculum narrowly unguiculate, margins serrate.

Key to the Philippine species of Pterocera.

- a*¹. Columella smooth; lip 7-clawed.
 - b*¹. Body whorl slightly tubercled; claws short, upturned; interior of aperture pale flesh-colored *P. bryonia*.
 - b*². Body whorl slightly tubercled; claws slender, interior deep orange. *P. aurantia*.
 - b*³. Body whorl very strongly tubercled; claws slender, three on lip upturned; interior flesh-colored *P. lambis*.
- a*². Columella wrinkled.
 - b*¹. Lip 6-clawed.
 - c*¹. Columella very slightly wrinkled; interior deep flesh-colored. *P. chiragra*.
 - c*². Columella strongly wrinkled; interior dark purple *P. rugosa*.
 - b*². Lip 7-clawed, claws tubercled; interior pinkish flesh, stained with deep violet *P. scorpio*.
 - b*³. Lip 9-clawed; aperture deep purple, wrinkles white *P. elongata*.
 - b*⁴. Lip 10-clawed; aperture smoky purple, wrinkles whitish. *P. millepeda*.

PTEROCERA BRYONIA (Gmelin).*Strombus bryonia* GMELIN, p. 3520.*Strombus truncatus* DILLWYN, Cat. Rec. Shells 2 (1817) 659.

Pterocera truncata LAMARCK, Anim. sans Vert. 7 (1822) 195; SOWERBY, Thes. Conchyl. 1st (1842) 41, pl. 11, fig. 13; KIENER, Icon. Coq. Viv. *Pterocera* 4 (1843) 3, pl. 10, fig. 3.

Pterocera bryonia GMELIN in Reeve, Conchol. Icon. *Pterocera* 6 (1851) pl. 1; TRYON, Man. Conchol. 7 (1885) 124, pl. 8, fig. 4; pl. 9, fig. 8; HIDALGO, Cat. Marine Moll. (1904) 138; FAUSTINO, Bur. Sci. Monog. 25 (1928) 210.

Shell oblong-ovate; spire often truncate; whorls transversely striated, upper part concave, angle strongly noduled, body slightly tubercled; lip very widely expanded, 7-clawed, claws stout, rather curved posteriorly; creamy white, a little stained with brown; interior smooth, pale flesh-colored; columella callous.

Length, 220 millimeters; breadth, 140; thickness, 97; height of spire, 68; height of body whorl, 168.

SIBUYAN, Romblon Province, *Bur. Sci.* 14690 Lopez; CEBU and MINDANAO, *Hidalgo*. LUBANG, Mindoro Province, *Bur. Sci.* 14887 de Mesa.

A very large species, measuring a little less than a foot in its entire length, characterized by the tubercles on the body whorl, with the digits short and stout. The columella is covered by a callosity which extends to the dorsal surface, almost entirely covering the spire. The external coloration is lighter than that of *P. lambis*, and the digits shorter.

PTEROCERA AURANTIA Lamarck.

Pterocera aurantia LAMARCK, Anim. sans Vert. 7 (1822) 198; SOWERBY, Thes. Conchyl. 1² (1842) 42, pl. 11, fig. 11; KIENER, Icon. Ciq. Viv. Pterocera 4 (1843) 11, pl. 7; REEVE, Conchol. Icon. Pterocera 6 (1851) pl. 5, fig. 7; TRYON, Man. Conchol. 7 (1885) 124, pl. 9, fig. 5; HIDALGO, Cat. Marine Moll. (1904) 138; FAUSTINO, Bur. Sci. Monog. 25 (1928) 210.

Shell ovate; spire acuminate; whorls transversely finely striated, upper part rather concave, angle noded, body whorl lightly tubercled; lip expanded, 7-clawed, claws curved, generally pointing posteriorly, three side claws short, the rest rather long; yellowish white, stained with pale-orange blotches throughout; interior of aperture very deep orange, smooth; columella callous.

Length, 60 millimeters; breadth, 38; thickness, 27; height of spire, 16; height of body whorl, 46.

MINDANAO, Surigao Province, *Bur. Sci.* 209, *Quadras*. On the reefs.

A medium-sized shell, easily recognized by the deep orange of the aperture and the slender curved claws.

PTEROCERA LAMBIS (Linnæus).

Strombus lambis LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1208; DILLWYN, Cat. Recent Shells 2 (1817) 658.

Pterocera lambis LAMARCK, Anim. sans Vert. (1801) 81; 7 (1822) 196; KIENER, Icon. Coq. Viv. Pterocera 4 (1843) 7, pl. 3; pl. 4, fig. 1.

Pterocera lambis (Linnæus) SOWERBY, in Thes. Conchyl. 1² (1842) 41, pl. 11, figs. 5, 6, 7; REEVE, Conchol. Icon. Pterocera 6 (1851) pl. 5, fig. 8; TRYON, Man. Conchol. 7 (1885) 124, pl. 8, figs. 1-3; HIDALGO, Cat. Marine Moll. (1904) 138; FAUSTINO, Bur. Sci. Monog. 25 (1928) 210.

Shell oblong-ovate; spire acuminate; whorls transversely striated, upper part concave, angle strongly noded; body whorl very prominently tubercled; lip rather expanded, digitated; digits seven, slender, long, a few on the lip upturned; yellowish brown, spotted with reddish brown throughout; interior of aperture pale flesh-colored; columella callous, smooth.

Length, 120 millimeters; breadth, 67; thickness, 75; height of spire, 28; height of body whorl, 68.

LUZON, *Bur. Sci.* 16052 Mitchell. BATAN, Albay Province, *Bur. Sci.* 12853, 12854, 12856, 12957 Faustino and Abad. MINDORO, Puerto Galera, *Bur. Sci.* 14698 Seale, 14699 Alcasid. CEBU, Cebu, *Bur. Sci.* 11820 Smith. MACTAN, Cebu Province, *Bur. Sci.* 13734 Smith. BOHOL, *Bur. Sci.* 14168 Kelley. SIBUYAN, Romblon Province, *Bur. Sci.* 14700 Lopez. NEGROS, Sicaba, *Bur. Sci.* 14701 Talavera; Escalante, *Bur. Sci.* 14702 Talavera. LEYTE, San Isidro, Davao, *Bur. Sci.* 14703 Teves. BUSUANGA, Palawan Province, *Bur. Sci.* 12742 Lopez. CUYO, Palawan Province, *Bur. Sci.* 12097, 12098 Lopez. DINAGAT, Surigao Province, *Bur. Sci.* 12248 Lopez. JOLO, *Bur. Sci.* 14704 Smith.

This species is most abundant in the Philippines. It can be easily distinguished from the preceding species by the very prominent tubercles on the last whorl, the less expanded lip, the longer and slender digits, and the livid flesh color of the interior of the aperture. The spire is always acuminate and the shoulders of the whorls are strongly noded.

PTEROCERA CHIRAGRA (Linnaeus).

Strombus chiragra LINNÆUS, *Syst. Nat.* ed. 12 1² (1767) 1207; DILLWYN, *Cat. Recent Shells* 2 (1817) 657.

Pterocera chiragra LAMARCK, *Anim. sans Vert.* 7 (1822) 198; KIENER, *Icon. Coq. Viv. Pterocera* 4 (1848) 5, pl. 5; pl. 10, fig. 2.

Pterocera chiragra (Linnaeus) SOWERBY, *Thes. Conchyl.* 1² (1842) 42, pl. 11, fig. 12; REEVE, *Conchol. Icon. Pterocera* 6 (1851) pl. 2; TRYON, *Man. Conchol.* 7 (1885) 126, pl. 10, fig. 13; HIDALGO, *Cat. Marine Moll.* (1904) 138; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 210.

Shell oblong-ovate; spire rather short, acuminate; whorls concave, angles noded, transversely striated, striae raised, more or less regular; body whorl rudely transversely ribbed, ribs tubercled; lip rather expanded, 6-clawed, claws curved, generally pointed posteriorly, rather long, stout; whitish, variegated with reddish-chestnut throughout; columella and interior of aperture deep flesh-colored, very slightly wrinkled.

Length, 113 millimeters; breadth, 90; thickness, 69; height of spire, 23; height of body whorl, 90.

BATAN, Batanes Province, Basco, *Bur. Sci.* 14666 Lopez. MINDORO, Puerto Galera, *Bur. Sci.* 204, 13732 Seale, 14582 Teves.

CEBU, Cebu, *Bur. Sci.* 14705 Smith. SEMIRARA, Antique Province, *Phil. Nat. Hist. Mus.*³ 15501 *Alcasid*.

A large species, widely distributed throughout the Philippines. It is easily distinguished by its variegated dorsal surface, its widely expanded claws, and the very slightly wrinkled flesh-colored interior. The digits of this species are rather channelled and open near the base.

PTEROCERA RUGOSA Sowerby.

Pterocera rugosa SOWERBY, *Thes. Conchyl.* 1² (1842) 42, pl. 11, figs. 9, 10; REEVE, *Conchol. Icon. Pterocera* 6 (1851) pl. 4, fig. 6; TRYON, *Man. Conchol.* 7 (1885) 126, pl. 10, fig. 12; HIDALGO, *Cat. Marine Moll.* (1904) 139; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 211.

Shell oblong-ovate; spire short, acuminate; whorls concave, angles obsoletely noduled, transversely finely striated; body whorl rudely transversely ribbed; ribs tubercled; lip rather expanded, 6-clawed; claws rather long, curved, generally pointing posteriorly; whitish, variegated with reddish chestnut throughout; columella and interior of aperture strongly wrinkled throughout, very dark purple gradually diminishing to a deep flesh at the border of the lip; wrinkles yellowish white.

Length, 78 millimeters; breadth, 59; thickness, 40; height of spire, 19; height of body whorl, 59.

The specimen here described, *Bur. Sci.* 13080, was purchased from H. C. Fulton and was obtained by him from Ceylon. The first record crediting this species to the Philippines appears to be Hidalgo's Catalogue, based on a collection of Baranda now in the Museo de Madrid.

PTEROCERA SCORPIO (Linnæus).

Strombus scorpius LINNÆUS, *Syst. Nat.* ed 12 1² (1767) 1208; DILLWYN, *Cat. Recent Shells* 2 (1817) 657.

Pterocera scorpio LAMARCK, *Anim. sans Vert.* 7 (1822) 197; SOWERBY, *Thes. Conchyl.* 12 (1842) 43, pl. 11, fig. 1; KIENER, *Icon. Coq. Viv. Pterocera* 4 (1843) 13, pl. 6; REEVE, *Conchol. Icon. Pterocera* 6 (1851) pl. 3, fig. 3; TRYON, *Man. Conchol.* 7 (1885) 125, pl. 9, fig. 6; HIDALGO, *Cat. Marine Moll.* (1904) 139; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 211.

Shell oblong-ovate, spire rather short, acuminate; whorls flatly inclined at upper part, angle sharp, very slightly tubercled,

³ Specimens acquired after the organization of the Philippine Natural History Museum.

transversely finely striated; body whorl transversely rudely ribbed; ribs tubercled; lip rather expanded, 7-clawed; claws noduled; three side claws short, curved; anterior claw long, slender, very slightly noduled; three posterior claws long, strongly noduled; yellowish white, variegated throughout with chestnut; columella and interior strongly wrinkled, dark purple, gradually diminishing to pinkish flesh towards the border of the lip; wrinkles yellowish white.

Length, 58 millimeters; breadth, 37; thickness, 25; height of spire, 13; height of body whorl, 45.

MINDORO, Naujan, *Bur. Sci.* 208 *Quadras.* MARINDUQUE, BOHOL, and CEBU, *Elera.* MINDANAO, Zamboanga Province, *Hidalgo.*

Easily distinguished by its nodulous claws and dark-purple, strongly wrinkled interior.

PTEROCERA MILLEPEDA (Linnaeus).

Strombus millepeda LINNÆUS, *Syst. Nat.* ed. 12 1² (1767) 1208; DILLWYN, *Cat. Recent Shells* 2 (1817) 659.

Pterocera millepeda LINNÆUS in Lamarck, *Anim. sans Vert.* 7 (1822) 196; SOWERBY, *Thes. Conchyl.* 1² (1842) 43, pl. 11, fig. 3; KIENER, *Icon. Coq. Viv. Pterocera* 4 (1843) 10, pl. 9, fig. 1; pl. 10, fig. 1; REEVE, *Conchol. Icon. Pterocera* 6 (1851) pl. 6, fig. 10; TRYON, *Man. Conchol.* 7 (1885) 125, pl. 9, fig. 9; HIDALGO, *Cat. Marine Moll.* (1904) 139; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 211.

Shell oblong-ovate, spire rather short, acuminate; whorls concave, angle strongly noduled, transversely finely striated; body whorl transversely ribbed; ribs rudely tubercled; lip rather expanded, 10-clawed; claws short, those at the side curved, pointing posteriorly; anterior claws long, slightly bent; whitish, stained with orange blotches; interior of aperture and columella smoky-purple, gradually diminishing to a very light chestnut at border of lip; strongly wrinkled; wrinkles yellowish white.

Length, 84 millimeters; breadth, 52; thickness, 35; height of spire, 24; height of body whorl, 60.

BANTAYAN, Cebu Province, *Bur. Sci.* 14706 *Lopez.* SIBUYAN, Romblon Province, *Bur. Sci.* 14707 *Lopez.* SAMAR, *Bur. Sci.* 11782. MINDANAO, *Bur. Sci.* 207 *Quadras.*

PTEROCERA ELONGATA Swainson.

Strombus millepeda LINNÆUS (in part) in Dillwyn, *Cat. Recent Shells* 2 (1817) 660.

Pterocera elongata SWAINSON in Sowerby, *Thes. Conchyl.* 1² (1842) 44, pl. 11, fig. 4; KIENER, *Icon. Coq. Viv. Pterocera* 4 (1843) 8, pl. 8; REEVE, *Conchol. Icon. Pterocera* 6 (1851) pl. 6, fig. 9; TRYON, *Man. Conchol.* 7 (1885) 125, pl. 9, fig. 10; HIDALGO, *Cat. Marine Moll.* (1904) 138; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 210.

This species is very closely allied to the preceding, differing only in its slenderer form, in having less digits, and in the deeper body coloration. It is regrettable that there is no specimen in the Museum's collection, so that the writer had no opportunity of examining one.

Genus STROMBUS Linnæus

Strombus LINNÆUS, Syst. Nat. ed. 12 1^a (1767) 1207.

Shell ovate; spire turreted; body whorl prominent; aperture elongate, truncate and channelled anteriorly, canaliculate posteriorly; lip somewhat broadly expanded, plain, lobed, or slightly digitated. Operculum unguiculate.

Key to Philippine species of *Strombus*.

- a*¹. Lip broadly expanded.
 - b*¹. Border of lip thickened and in-folded.
 - c*¹. Upper part solid; aperture white *S. latissimus*.
 - c*². Upper part thin, digitated; aperture deep purple..... *S. laciniatus*.
 - b*². Lip thickened; simple or lobed.
 - c*¹. Lip lobed at the upper part *S. auris-dianæ*.
 - c*². Lip simple.
 - d*¹. Body strongly noduled.
 - e*¹. Aperture flesh-colored *S. lentiginosus*.
 - e*². Aperture dark safron to purple *S. papilio*.
 - d*². Body smooth or slightly noduled.
 - e*¹. Aperture with short posterior canal.
 - f*¹. Lip very thick; body covered with longitudinal, wavy, brown streaks *S. canarium*.
 - f*². Lip rather thin, body plain orange-brown..... *S. isabella*.
 - e*². Aperture with long decumbent posterior canal.
 - f*¹. Interior of aperture smooth.
 - g*¹. Body creamy white *S. epidromis*.
 - g*². Body mottled and transversely banded with brown; columella blotched with dark chestnut..... *S. variabilis*.
 - g*³. Body reddish brown, interior bright lemon-yellow.
 - S. minimus*.
 - f*². Interior of aperture lightly radiately striated.
 - g*¹. Interior of aperture wavy white *S. labiosus*.
 - g*². Interior of aperture stained with rusty brown.
 - S. columba*.
 - a*². Lip slightly expanded.
 - b*¹. Spire very much exserted *S. vittatus*.
 - b*². Spire not very much exserted.
 - c*¹. Body whorl not tubercled.
 - d*¹. Aperture with long, decumbent, posterior canal.
 - e*¹. Spire acutely angled *S. marginatus*.
 - e*². Spire finely tubercled *S. succinctus*.

- d*². Aperture with very short posterior canal.
 - e*¹. Aperture white *S. gibberulus*.
 - e*². Aperture deep flesh-colored *S. lubuanus*.
- c*². Body whorl tubercled.
 - d*¹. Columella completely striated.
 - e*¹. Body tubercles prominent *S. dentatus*.
 - e*². Body tubercles not prominent *S. floridus*.
 - d*². Columella partly striated.
 - e*¹. Shell transversely striated at base only *S. urceus*.
 - e*². Shell transversely striated throughout.
 - f*¹. Shell elongate *S. elegans*.
 - f*². Shell short and stout *S. rugosus*.
- a*². Lip not expanded. Shell slender, lip slightly lobed or simple.
 - b*¹. Lip 3-lobed *S. samar*.
 - b*². Lip simple.
 - c*¹. Shell subcylindrical, stout; aperture dark chestnut *S. bulbulus*.
 - c*². Shell elongate, thin, smooth; mottled with brown; aperture white.
 - S. terebellatus*.

STROMBUS LATISSIMUS Linnaeus.

Strombus latissimus LINNÆUS, Syst. Nat. ed 12 (1767) 1211; DILL-WYN, Cat. Recent Shell 2 (1817) 668; LAMARCK, Anim. sans Vert. 7 (1822) 250; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 4, fig. 4; TRYON, Man. Conchol. 7 (1885) 111, pl. 3, fig. 27; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 6, pl. 4; HIDALGO, Cat. Marine Moll. (1904) 136; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Shell ovate, swollen, rudely tubercled; spire conical, pointed; whorls 9 or 10, upper part concave, shoulders strongly noduled, oftentimes radiately ridged towards lip; lip broadly expanded, extending much beyond spire, side very much thickened and in-folded; body whitish to yellowish, longitudinally lineated with orange-brown streaks and mottled with white blotches; interior of aperture white.

Height, 190 millimeters; breadth, 133; thickness, 18; height of spire, 45; height of body whorl, 145.

The only properly recorded specimen in the Museum's collection was purchased from H. C. Fulton, and is marked 'Philippines.' There are several specimens from the Quadras and Zobel collections, but they do not bear localities. However, this species has been reported by Cuming from Matnog, Sorsogon.

STROMBUS LACINIATUS Chemnitz.

Strombus laciniatus CHEMNITZ, Conch. Cab. 10 (1769-1829) 223, pl. 158, figs. 1506, 1507; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 11, fig. 25; TRYON, Man. Conchol. 7 (1885) 111, pl. 3, fig. 26; HIDALGO, Cat. Marine Moll. (1904) 136; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Strombus cristatus LAMARCK, Anim. sans Vert. 7 (1822) 202; KIENER, Icon Coq. Viv. Strombus 4 (1843) 8, pl. 11.

Shell ovate; spire exerted, turreted, spirally finely striated; whorls profusely noded at angles, those on body whorl very strong; lip broadly expanded, extending and closely applied to spire, side thickly in-folded, upper part thin and rather digitated; columella callous; callosity covering greater part of spire; back of lip radiately ribbed; body whitish, variegated with orange-brown; interior of aperture deep-purple, fading towards lip.

Height, 108 millimeters; breadth, 75; thickness, 46; height of spire, 39; height of body whorl, 70.

MINDANAO, Surigao Province, *Bur. Sci.* 222 *Quadras*. DINAGAT, Surigao Province, *Bur. Sci.* 12261 *Lopez*.

The deep purple of the interior and the crested expanded lip characterize this species.

STROMBUS AURIS-DIANÆ Linnæus.

Strombus auris-dianæ LINNÆUS, Syst. Nat. ed 12 1¹ (1767) 1209; DILLWYN, Cat. Recent Shells 2 (1817) 663; LAMARCK, Anim. sans Vert. 7 (1822) 204; SOWERBY, Thes. Conchyl. 1² (1842) 35, pl. 9, figs. 101, 102; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 22, pl. 16, fig. 1; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 15, figs. 36a, b, 37; TRYON, Man. Conchol. 7 (1885) 113, pl. 4, figs. 37, 38; HIDALGO, Cat. Marine Moll. (1904) 134; IWAKAWA, Cat. Jap. Moll. (1919) 85; FAUSTINO, Bur. Sci. Monog. 25 (1928) 211.

Strombus lamarckii GRAY in Sowerby, Thes. Conchyl. 1² (1842) 35, pl. 9, figs. 88, 93, 98, 99; HIDALGO, Cat. Marine Moll. (1904) 136.

Strombus melanostomus SWAINSON in Kiener, Icon. Coq. Viv. Strombus 4 (1843) 19, pl. 12, fig. 1; pl. 14, fig. 2; SOWERBY, Thes. Conchyl. 1² (1842) 36, pl. 9, figs. 89, 90, 94; HIDALGO, Cat. Marine Moll. (1904) 136.

Strombus auris-dianæ var. *melanostomus* SWAINSON in Tryon, Man. Conchol. 7 (1885) 113, pl. 4, fig. 38.

Strombus guttatus (Martini) KIENER, Icon. Coq. Viv. Strombus 4 (1843) 24, pl. 15, fig. 1; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 14, fig. 33; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Pugil guttatus lævis MARTINI, Conch. Cab. 8 (1769-1829) 126, pl. 84, fig. 840.

Shell oblong-ovate; spire acuminate; whorls eight, upper part concave, oftentimes transversely ridged, shoulders tubercled; outer lip expanded, thickened, upper part extended to a fingerlike lobe; columella callous, callosity extending to apex of spire; anterior canal upturned; body brownish, spotted with white; interior of aperture whitish, slightly wrinkled at upper part, throat orange.

Height, 67 millimeters; breadth, 35; thickness, 26; height of spire, 25; height of body whorl, 42.

LUZON, Bataan Province, Mariveles, *Hidalgo*: Tayabas Province, Catanauan, *Bur. Sci.* 14035 *Navarro*. SIBUYAN, Romblon Province, San Fernando, *Bur. Sci.* 12065 *Hayne*. MINDORO, Puerto Galera, *Bur. Sci.* 14539 *Alcasid*; Naujan, *Bur. Sci.* 213 *Quadras*. LUBANG, Mindoro Province, Looc Bay, *Bur. Sci.* 14878 *de Mesa*. MARINDUQUE, Gasan, *Bur. Sci.* 215 *Quadras*. CEBU, *Bur. Sci.* 230 *Quadras*. BURIAS, *Elera*.

There has been considerable conflict regarding the differences among typical *auris-dianæ* and the forms *melanostomus* and *guttatus*. All these forms are found in the Philippines and are considered as one in this report.

STROMBUS LENTIGINOSUS Linnæus.

Strombus lentiginosus LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1208; DILLWYN, Cat. Recent Shells 2 (1817) 660; LAMARCK, Anim. sans Vert. 7 (1822) 203; SOWERBY, Thes. Conchyl. 1¹ (1842) 37, pl. 8, fig. 79; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 25, pl. 18, fig. 1; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 13, fig. 31; TRYON, Man. Conchol. 7 (1885) 110, pl. 3, figs. 23, 24; HIDALGO, Cat. Marine Moll. (1904) 136; IWAKAWA, Cat. Jap. Moll. (1919) 85; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Shell oblong-ovate; spire conical, short; whorls eight, profusely noduled at angles, those on body whorl strong, spirally striated along the upper part; columella callous, callosity sometimes extending to tip of spire; lip expanded, slightly thickened at side, somewhat lobed on upper part; body yellowish, spirally mottled with irregular chestnut-brown spots, interior of aperture flesh-colored, edge of lip tessellated with rectangular brownish blotches.

Height, 67 millimeters; breadth, 46; thickness, 33; height of spire, 20; height of body whorl, 48.

LUZON, *Bur. Sci.* 16014 *Mitchell*; Bataan Province, Orion Santo Domingo, *Bur. Sci.* 15257 *Carpenter*. MINDORO, Calapan, *Bur. Sci.* 14884 *de Mesa*; Naujan, *Bur. Sci.* 219 *Quadras*; Puerto Galera, *Bur. Sci.* 14551 *Alcasid*. MARINDUQUE, Boac, Laylay, *Bur. Sci.* 218 *Quadras*. BOHOL, *Bur. Sci.* 14172 *Kelley*. SOUTH GIGANTES, Iloilo Province, *Bur. Sci.* 14669 *Montalban*. DINAGAT, Surigao Province, *Bur. Sci.* 12187 *Lopez*. MINDANAO, Zamboanga Province, Dapitan, *Bur. Sci.* 225, 226, 227, *Quadras*.

The rugged sculpture on the dorsal side contrasted with a smooth ventral and variously mottled with chestnut-brown is more or less a constant characteristic of this species.

STROMBUS PAPILIO Chemnitz.

Strombus papilio CHEMNITZ, Conch. Cab. 10 (1769-1829) 226, pl. 158, figs. 1510, 1511; DILLWYN, Cat. Recent Shells 2 (1817) 661; LAMARCK, Anim. sans Vert. 7 (1822) 211; SOWERBY, Thes. Conchyl. 1¹ (1842) 31, pl. 7, fig. 44; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 26, pl. 17, figs. 1, 2; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 13, fig. 29; TRYON, Man. Conchol. 7 (1885) 110, pl. 3, fig. 25; HIDALGO, Cat. Marine Moll. (1904) 137; FAUSTINO, Bur. Sci. Monog. 25 (1928) 213.

Shell ovate; spire conical, short; whorls profusely noded at angles, those on body whorls strong, spirally striated throughout; columella callous, callosity extending to middle of spire; lip broadly expanded, thickened, situated at both ends; body whitish, spirally mottled with reddish-brown spots; interior of aperture dark safron to purple, radiately striated towards the margin.

Height, 47 millimeters; breadth, 32; thickness, 26; height of spire, 16; height of body whorl, 31.

BALABAC, *Bur. Sci.* 691 *Quadras*.

In sculpture the present species is similar to *S. lentiginosus*, from which it differs, however, by its smaller size and in the dark-purple and radiate striation within the interior of the expanded lip.

STROMBUS CANARIUM Linnaeus.

Strombus canarium LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1211; DILLWYN, Cat. Recent Shells 2 (1817) 670; LAMARCK, Anim. sans Vert. 7 (1822) 202; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 33, pl. 29, figs. 1, 1a; SOWERBY, Thes. Conchyl. 1¹ (1842) 33, pl. 8, figs. 69, 70; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 18, figs. 46a, b; TRYON, Man. Conchol. 7 (1885) 110, pl. 2, figs. 18-20; pl. 3, fig. 21; HIDALGO, Cat. Marine Moll. (1904) 134; FAUSTINO, Bur. Sci. Monog. 25 (1928) 211.

Shell shortly ovate, heavy; spire short, rather acuminate, varicose; whorls smooth, gibbous, sulcated near the apex; columella callous, outer lip thick, widely expanded; fulvous with longitudinal, irregular, wavy, brown streaks; interior of aperture ivory; columella and edge of outer lip rusty fawn-brown.

Height, 57 millimeters; breadth, 40; thickness, 28; height of spire, 14; height of body whorl, 43.

LUZON, Bataan Province, Mariveles, *Bur. Sci.* 229 *Quadras*. LUBANG, Mindoro Province, Tagbac Bay, *Bur. Sci.* 14885 *de Mesa*. PALAWAN, Caramay, *Bur. Sci.* 14933 *Alcasid*. BUSUANGA, Coron, *Bur. Sci.* 12121 *Lopez*. LINAPACAN, Palawan Province, *Bur. Sci.* 11897 *Lopez*. MINDORO, Calapan, *Bur. Sci.* 14446 *de Mesa*. BATAN, Albay Province, *Bur. Sci.* 12869 *Faus-*

tino. SAMAR, Jagor. LEYTE, Hidalgo. CEBU, Elera. MINDANAO, Surigao and Zamboanga, Hidalgo.

This species is closely allied to *S. isabella*, with the shell generally heavier and possessed of longitudinal brown streaks.

STROMBUS ISABELLA Lamarck.

Strombus isabella LAMARCK, Anim. sans Vert. 7 (1822) 207; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 18, fig. 51; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 32, pl. 25, fig. 2; TRYON, Man. Conchol. 7 (1885) 110, pl. 2, fig. 20, pl. 3, fig. 21; HIDALGO, Cat. Marine Moll. (1904) 136; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Shell very similar in form to the preceding in which it is generally included. It may be distinguished, however, by its lighter shell, yellowish or orange-brown and not provided with the longitudinal streaks characteristic of *S. canarium*.

Height, 75 millimeters; breadth, 45; thickness, 34; height of spire, 24; height of body whorl, 51.

LUZON, Zambales Province, *Bur. Sci.* 16023 Mitchell: Rizal Province, Pasay, *Bur. Sci.* 14330 Alcasid: Tayabas Province, Catanauan, *Bur. Sci.* 14633 Navarro. BATAN, Albay Province, *Bur. Sci.* 12865 Faustino. MINDORO, Calapan, *Bur. Sci.* 14446 de Mesa. PALAWAN, Puerto Princesa, *Bur. Sci.* 11918 Lopez; Caramay, *Bur. Sci.* 14934 Alcasid, *Bur. Sci.* 11970 Lopez. FONDADO, Palawan Province, *Bur. Sci.* 15024 Alcasid. MINDANAO, *Bur. Sci.* 288 Quadras.

STROMBUS EPIDROMIS Linnaeus.

Strombus epidromis LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1211; DILLWYN, Cat. Recent Shells 2 (1817) 669; LAMARCK, Anim. sans Vert. 7 (1822) 208; SOWERBY, Thes. Conchyl. 1¹ (1842) 28, pl. 6, fig. 12; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 48, pl. 26, fig. 1; pl. 33, fig. 4; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 19, fig. 54; TRYON, Man. Conchol. 7 (1885) 116, pl. 5, fig. 55; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Shell ovate; spire short, turreted, sometimes varicose, apex pointed; first five whorls longitudinally ridged, the rest smooth, rather angled, angles noded, those on the body whorl almost flattened: columella callous; lip broadly expanded, rounded and thickened towards the margin; posterior canal reaching and closely applied to second whorl; body white, freckled with fawn-brown; columella and interior of aperture ivory-white, inner edge of lip and region beyond the columella stained with light brown.

Height, 79 millimeters; breadth, 45; thickness, 28; height of spire, 25; height of body whorl, 54.

POLILLO, Tayabas Province, *Bur. Sci.* 12942 Robinson. MARINDUQUE, Balanacan, *Bur. Sci.* 223 Quadras. GILOTONGAN, Cebu Province, *Bur. Sci.* 16374 Boiden. SITANKAI, Sulu Province, *Bur. Sci.* 1255 Seale.

A fairly large shell of even sculpture, characterized by the broadly expanded lip and dull body color.

STROMBUS VARIABILIS Swainson.

Strombus variabilis SWAINSON in Sowerby, *Thes. Conchyl.* 1⁴ (1842) 27, pl. 6, figs. 9, 13, 14; KIENER, *Icon. Coq. Viv. Strombus* 4 (1843) 49, pl. 21, fig. 2; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 10, figs. 21a-d; TRYON, *Man. Conchol.* 7 (1885) 117, pl. 6, figs. 59-61; HIDALGO, *Cat. Marine Moll.* (1904) 137; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 214.

Shell oblong or elongate-ovate; spire exserted, turreted, acuminate, oftentimes varicose near the apex; whorls concave round the upper part, smooth, transversely striated at base, noduled at angles; columella callous, smooth; lip broadly expanded, sinuated at both ends, thickened towards edge; body white, mottled with brown and transversely banded with four or five broken white lines on body whorl; interior of aperture smooth white, columella oftentimes blotched with dark chestnut.

Height, 51 millimeters; breadth, 27; thickness, 18; height of spire, 20; height of body whorl, 31.

LUZON, *Bur. Sci.* 14213 Strong: Tayabas Province, Catanauan, Yuni, *Bur. Sci.* 14637 Navarro. TICAQ, Masbate Province, *Cuming.* CEBU, *Hidalgo.* MINDANAO, Surigao, *Elera.*

STROMBUS MINIMUS Linnaeus.

Strombus minimus LINNÆUS in Dillwyn, *Cat. Recent Shells* 2 (1817) 670; SOWERBY, *Thes. Conchyl.* 1¹ (1842) 28, pl. 6, figs. 4, 5; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 18, fig. 47; TRYON, *Man. Conchol.* 7 (1885) 117, pl. 6, fig. 62; HIDALGO, *Cat. Marine Moll.* (1904) 136; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 213.

Strombus troglodytes LAMARCK, *Anim. Sans. Vert.* 7 (1822) 209; KIENER, *Icon. Coq. Viv. Strombus* 4 (1843) 52, pl. 31, fig. 2.

Shell ovate; spire acuminate, turreted, varicose along apex; body whorl strongly noduled along angle; lip broadly expanded, sinuated at both ends, thickened and somewhat reflected at margin; columella callous; posterior sinus elongate and closely applied to second whorl; body reddish brown, sometimes speckled with yellow throughout or banded with yellow on the body whorl; interior of aperture bright lemon-yellow.

Height, 34 millimeters; breadth, 20; thickness, 14; height of spire, 13; height of body whorl, 21.

LUZON, Tayabas Province, Catanauan, Yuni, *Bur. Sci.* 41634 Navarro. LUBANG, Mindoro Province, *Bur. Sci.* 14886 de Mesa. MARINDUQUE, Boac, Laylay, *Bur. Sci.* 236 Quadras. SIBUYAN, Romblon Province, *Bur. Sci.* 77 Lopez. MINDANAO, Davao Gulf, *Bur. Sci.* 87 Ickis: Zamboanga Province, *Bur. Sci.* 15282 Domantay.

A species of wide range in color variation. Some specimens are plain dark reddish brown, others are speckled with yellowish dots, and the typical forms are banded, one band along the shoulder and one or two across the body whorl. The sculpture is similar to *S. labiosus* with the shells decidedly smaller and the posterior sinus more developed and taking a different direction.

STROMBUS LABIOSUS Gray.

Strombus labiosus GRAY in REEVE, Conchol. Icon. Strombus 6 (1851) pl. 18, fig. 50; TRYON, Man. Conchol. 7 (1885) 116, pl. 5, fig. 51; HIDALGO, Cat. Marine Moll. (1904) 136; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 212.

Shell triangular-ovate; spire exserted, acuminate; whorls nine, somewhat rounded, spirally striated, striae strongest at border of lip, longitudinally ridged; whorls angled, angles slightly tubercled; lip broadly expanded, thickened, deeply radiately striated within; columella callous, slightly wrinkled; body whitish to yellowish fawn, sometimes washed with reddish brown; interior of aperture ivory-white.

Height, 57 millimeters; breadth, 34; thickness, 25; height of spire, 23; height of body whorl, 34.

This species has been reported from Cuming's collection from Cagayan, Mindanao. The only specimen in the Museum's collection, *Bur. Sci.* 15256, has been secured through the kindness of Dr. William J. Clench, of Harvard.

STROMBUS COLUMBA Lamarck.

Strombus columba LAMARCK, Anim. sans. Vert. 7 (1822) 208; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 51, pl. 25, figs. 1, la; SOWERBY, Thes. Conchyl. 1¹ (1842) 27, pl. 6, figs. 2, 3, 6, 7; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 12, figs. 26a, b; TRYON, Man. Conchol. 7 (1885) 115, pl. 5, figs. 49, 50; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 211.

Shell oblong-ovate, longitudinally plaited, transversely striated; spire short, varicose; apex pointed; whorls convex with few nodules at angle; lip broadly expanded, heavily striated towards

dorsal margin, interior strongly striated; columella callous with prominent striæ; body white with orange-brown specks or bands, interior stained with rusty brown at throat.

Height, 46 millimeters; breadth, 23; thickness, 18; height of spire, 16; height of body whorl, 31.

PHILIPPINES, *Bur. Sci.* 13283 *Fulton*. This species was reported from Malanipa Island, *Watson*.

Distinguished by its broadly expanded lip with heavy striations outside and within, and a tinge of rusty brown internally.

STROMBUS VITTATUS Linnæus.

Strombus vittatus LINNÆUS, *Syst. Nat.* ed. 12 1² (1767) 1211; DILLWYN, *Cat. Marine Shells* 2 (1817) 671; LAMARCK, *Anim. sans Vert.* 7 (1822) 207; SOWERBY, *Thes. Conchyl.* 1¹ (1842) 26, pl. 6, figs. 27-31; KIENER, *Icon. Coq. Viv. Strombus* 4 (1843) 40, pl. 23, figs. 1, 1a-b; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 17, fig. 44; TRYON, *Man. Conchol.* 7 (1885) 114, pl. 4, figs. 41-44; HIDALGO, *Cat. Marine Moll.* (1904) 137; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 214.

Strombus turritus LAMARCK, *Anim. sans Vert.* 7 (1822) 212.

Shell elongate, rather fusiform; spire very much exerted, turreted, varicose near apex; whorls grooved at base, margined at upper part, sometimes transversely finely striated, longitudinally ridged; columella callous, narrow, smooth; lip broadly expanded, somewhat winged, radiately striated on inner part; body yellowish, stained or dotted with warm brown, transversely banded with three or four narrow, interrupted, white lines; columella and interior of aperture white.

Height, 65 millimeters; breadth, 29; thickness, 20; height of spire, 0; height of body whorl, 35.

LUZON, Manila Bay, *Bur. Sci.* 238 *Quadras*. MINDORO, Puerto Galera, *Bur. Sci.* 11733 *Seale*. SAMAR, *Bur. Sci.* 16017 *Mitchell*.

STROMBUS MARGINATUS Linnæus.

Strombus marginatus LINNÆUS, *Syst. Nat.* ed. 12 1² (1767) 1209; DILLWYN, *Cat. Recent Shells* 2 (1817) 665; LAMARCK, *Anim. sans Vert.* 7 (1822) 211; SOWERBY, *Thes. Conchyl.* 1¹ (1842) 28, pl. 6, fig. 17; KIENER, *Icon. Coq. Viv. Strombus* 4 (1843) 44, pl. 16, fig. 2; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 18, fig. 49; TRYON, *Man. Conchol.* 7 (1885) 116, pl. 5, figs. 53, 54; HIDALGO, *Cat. Marine Moll.* (1904) 136; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 213.

Shell elongate-obconical; spire short, acuminate, longitudinally ridged, varicose at upper part; whorls eight, rather concave on upper part, angle sharply keeled, spirally faintly lineated, slightly grooved near base; columella callous; lip narrowly ex-

panded, rather thickened, slightly wrinkled within; body white, spirally 5-banded with wavy reddish-brown streaks; interior of aperture white.

Height, 47 millimeters; breadth, 28; thickness, 22; height of spire, 13; height of body whorl, 35.

The only specimen in the Museum's collection, *Bur. Sci.* 13285, was obtained from H. C. Fulton and is marked 'Philippines.' The first record crediting this species to the Philippines was Reeve's *Conchol. Icon.* based on Cuming's collections.

STROMBUS SUCCINCTUS Linnæus.

Strombus succinctus LINNÆUS, *Syst. Nat.* ed. 12 1^a (1767) 1212; LAMARCK, *Anim. sans Vert.* 7 (1822) 208; SOWERBY, *Thes. Conchyl.* 1¹ (1842) 28, pl. 6, figs. 20, 21; KIENER, *Icon. Coq. Viv. Strombus* 4 (1843) 45, pl. 10, fig. 2; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 17, fig. 43; TRYON, *Man. Conchol.* 7 (1885) 116, pl. 6, figs. 56, 57; HIDALGO, *Cat. Marine Moll.* (1904) 137; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 213.

Strombus accinctus LINNÆUS in Dillwyn, *Cat. Recent Shells* 2 (1817) 672.

Shell oblong or elongate-ovate; spire exerted, acuminate, turreted; whorls somewhat concave around upper part, longitudinally ridged near apex, sometimes varicose, angles tubercled, angles on body whorls very slight, almost smooth, finely transversely striated; columella callous, smooth, narrow; lip expanded, rather thickened, sinuate at both ends, posterior canal closely applied up to second whorl; body white, mottled throughout with wavy reddish-brown streaks, transversely banded with four or five narrow white strands on body whorl; interior of aperture white, radiately striated towards margin.

Height, 47 millimeters; breadth, 24; thickness, 19; height of spire, 16; height of body whorl, 31.

PHILIPPINES, *Bur. Sci.* 13284 *Fulton.* LUZON, *Bur. Sci.* 11881 *Quadras.*

This form presents a wide color range, some specimens being plain reddish brown with faint white bands, others white, mottled with pale-brown streaks. The sculpture is constant, the body whorl almost smooth except for an occasional node at the region of the shoulder.

STROMBUS GIBBERULUS Linnæus.

Strombus gibberulus LINNÆUS, *Syst. Nat.* ed. 12 1^a (1767) 1910; DILLWYN, *Cat. Recent Shells* 2 (1817) 666; LAMARCK, *Anim. sans Vert.* 7 (1822) 205; SOWERBY, *Thes. Conchyl.* 1¹ (1842) 31; REEVE, *Conchol. Icon. Strombus* 6 (1851) pl. 8, figs. 15a-b; TRYON, *Man.*

Conchol. 7 (1885) 121, pl. 8, fig. 85; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Shell elongate-ovate, attenuated at base; spire exserted, sharp; whorls rounded, unequally gibbous at shoulder, varicose, margined next to suture, transversely striated; columella callous, smooth; interior of aperture finely striated, whitish, sometimes banded with orange or reddish brown, interior of aperture ranging from white to purple.

Height, 50 millimeters; breadth, 24; thickness, 22; height of spire, 19; height of body whorl, 39.

LUZON, La Union Province, *Bur. Sci.* 247 *Quadras*. MINDORO, Puerto Galera, *Bur. Sci.* 15258 *Seale*. LUBANG, Mindoro Province, *Bur. Sci.* 14883 *de Mesa*. ROMBLON, *Bur. Sci.* 245 *Quadras*. SIBUYAN, Romblon Province, *Bur. Sci.* 15259 *Lopez*. SOUTH GIGANTES, Iloilo Province, *Bur. Sci.* 14672 *Montalban*. NEGROS, Occidental Negros Province, Escalante, *Bur. Sci.* 246 *Quadras*. LEYTE, Cabalian, *Bur. Sci.* 15260 *Lopez*. CUYO, Palawan Province, *Bur. Sci.* 14670, 11937 *Lopez*. FONDEADO, Palawan Province, *Bur. Sci.* 15047 *Alcasid*.

The distorted form is characteristic of this species with the banding and coloration very variable. Sometimes the body is of a plain yellowish tint and at times banded with orange or brown. The interior of the aperture is sometimes pink but varies through all shades to deep purple.

STROMBUS LUHUANUS Linnaeus.

Strombus luhuanus LINNÆUS, Syst. Nat. ed. 12 1¹ (1767) 1209; DILLWYN, Cat. Recent Shells 2 (1817) 666; LAMARCK, Anim. sans Vert. 7 (1822) 206; SOWERBY, Thes. Conchyl. 1¹ (1842) 29, pl. 7, fig. 54; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 9, fig. 19; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 39, pl. 27, fig. 1; TRYON, Man. Conchol. 7 (1885) 122, pl. 8, figs. 91, 92; HIDALGO, Cat. Marine Moll. (1904) 136; IWAKAWA, Cat. Jap. Moll. (1919) 87; FAUSTINO, Bur. Sci. Monog. 25 (1928) 213.

Shell obconical, solid; spire short, acuminate, few last whorls slightly varicose, whorls smooth, faintly grooved at upper part close to suture; body whorl somewhat humped at shoulder; columella straight, aperture narrow; lip slightly wrinkled within, somewhat expanded, straight, sinuate at upper part; body whitish, transversely banded with brown wavy streaks; columella purple black; interior of aperture deep flesh-colored.

Height, 60 millimeters; breadth, 32; thickness, 26; height of spire, 12; height of body whorl, 47.

LUZON, Ilocos Norte Province, Currimao, *Bur. Sci.* 12183 *Smith*; Batangas Province, Layia, *Bur. Sci.* 12843 *Herre*; Tayabas Province, Catanauan, Yuni, *Bur. Sci.* 14639 *Navarro*. MINDORO, Puerto Galera, *Bur. Sci.* 14552 *Alcasid*, *Bur. Sci.* 14595 *Teves*. LUBANG, Mindoro Province, *Bur. Sci.* 14881 *de Mesa*. ROMBLON, San Fernando, *Bur. Sci.* 12045 *Hayne*. BOHOL, *Bur. Sci.* 16013 *Mitchell*. DINAGAT, Surigao Province, *Bur. Sci.* 12196 *Lopez*. LINAPACAN, Palawan Province, *Bur. Sci.* 11912 *Lopez*. PALAWAN, Bacuit, *Bur. Sci.* 14221 *Merin*, *Cinco*, and *Worin*; Caramay, *Bur. Sci.* 14932 *Alcasid*; Binduyan, *Bur. Sci.* 14988 *Alcasid*. BALABAC, *Bur. Sci.* 212 *Quadras*.

Can be distinguished by the obconical form of the shell, the dark purple of the columella, and the bright flesh color of the aperture. Widely distributed in the Philippines, usually found on sandy-muddy flats.

STROMBUS DENTATUS Linnaeus.

Strombus dentatus LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1213; DILLWYN, Cat. Recent Shells 2 (1817) 674; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 9, fig. 17; TRYON, Man. Conchol. 7 (1885) 118, pl. 6, figs. 68, 70; pl. figs. 67-72.

Strombus plicatus LAMARCK, Anim. sans Vert. 7 (1822) 210; KIENER, Icon. Cop. Viv. Strombus 4 (1843) 62, pl. 31, figs. 1a, b; SOWERBY, Thes. Conchyl. 1¹ (1842) 30, pl. 7, fig. 56.

Shell elongate; spire turreted; whorls transversely striated, elongately ridged, well developed at angle, those on body whorls pronounced, rather compressed; columella thick, somewhat wrinkled; lip rather expanded, thickened; interior of aperture yellowish-brown, finely striated towards margin; body whitish to yellowish, speckled throughout with gray oftentimes admixed with brown, encircled with several narrow white bands; external edge of lip rusty brown.

Height, 39 millimeters; breadth, 20; thickness, 18; height of spire, 13; height of body whorl, 26.

LUBANG, Mindoro Province, *Bur. Sci.* 14445 *de Mesa*. MARINDUQUE, Boac, *Bur. Sci.* 14668 *Quadras*. MACTAN, Cebu Province, *Bur. Sci.* 14205 *Smith*. SOUTH GIGANTE, Iloilo Province, *Bur. Sci.* 12649, 12704 *Montalban*. FONDEADO, Palawan Province, *Bur. Sci.* 15035 *Alcasid*.

There is a wide range of variation in this species. Sometimes the body tubercles are not well developed, and there are cases where the longitudinal striæ are totally absent anteriorly, approaching the case in *S. urceus*. Coloration also varies from

white with gray specks to a total gray or warm brown with a few whitish spots or bands.

STROMBUS URCEUS Linnaeus.

Strombus urceus LINNÆUS, Syst. Nat. ed. 12 1^o (1767) 1212; DILLWYN, Cat. Recent Shells 2 (1817) 673; LAMARCK, Anim. sans Vert. 7 (1822) 210; SOWERBY, Thes. Conchyl. 1¹ (1842) 30, pl. 7, figs. 34-37, 41, 42; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 60, pl. 15, fig. 2; pl. 30, figs. 2, 3; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 11, figs. 24a-c; TRYON, Man. Conchol. 7 (1885) 118, pl. 6, figs. 65-67; HIDALGO, Cat. Marine Moll. (1904) 137; FAUSTINO, Bur. Sci. Monog. 25 (1928) 214.

Shell oblong or elongate-ovate, transversely striated at base; spire exserted, acuminate, turreted; body whorl noduled at angle; columella callous, narrow, slightly wrinkled; lip somewhat expanded, sinuate at anterior part, anterior canal truncate, upturned; body white to yellowish, mottled with gray or brown often arranged in bands; interior of aperture radiately striated, orange-yellow splashed with dark chestnut-brown.

Height, 48 millimeters; breadth, 23; thickness, 19; height of spire, 14; height of body whorl, 35.

LUZON, Ilocos Norte Province, Currimao, *Bur. Sci.* 14207 *Smith*: Bataan Province, Bagac, *Bur. Sci.* 234 *Quadras*: Tayabas Province, Catanauan, Yuni, *Bur. Sci.* 14638 *Navarro*. LUBANG, Mindoro Province, *Bur. Sci.* 14880 *de Mesa*. BANTAYAN, Cebu Province, *Bur. Sci.* 106 *Lopez*. GILOTONGAN, Cebu Province, *Bur. Sci.* 16375 *Boyden*. LEYTE, *Bur. Sci.* 14214 *Abad*. CULION, Palawan Province, *Bur. Sci.* 12040 *Lopez*. CUYO, Palawan Province, *Bur. Sci.* 11972, 12134 *Lopez*. PALAWAN, Puerto Princesa, *Bur. Sci.* 11979 *Lopez*; Caramay, *Bur. Sci.* 12062 *Lopez*. BALABAC, *Bur. Sci.* 235 *Quadras*.

The form is similar to *S. dentatus* and may be distinguished by its lighter body color, dark gray near the apex and at the anterior tip, and by the peculiar color of the aperture. In some specimens the aperture is intense dark gray while in others it may be plain orange.

STROMBUS FLORIDUS Lamarck.

Strombus floridus LAMARCK, Anim. sans Vert. 7 (1822) 211; KIENER, Icon. Coq. Viv. Strombus 4 (1843) 63, pl. 32, figs. 1, 1a-c; REEVE, Conchol. Icon. Strombus 6 (1851) pl. 7, figs. 11a-d; TRYON, Man. Conchol. 7 (1885) 119, pl. 7, figs. 73-76, 80, 83; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, Bur. Sci. Monog. 25 (1928) 212.

Strombus mutabilis SWAINSON in Sowerby, Thes. Conchyl. 1¹ (1842) 29, pl. 7, figs. 40, 45-47, 49, 52.

Shell ovate, thick; spire short, spirally ridged; ridges most prominent at base, deeply grooved near the sutures; whorls exserted, somewhat angled; angles obliquely tubercled, those on body whorl few and gently sloping anteriorly; columella thickened, finely wrinkled throughout; aperture oblong; lip almost straight, thickened, finely striated; interior of aperture scarlet pink; body whitish or yellowish, blotched, dotted or banded with pale orange-brown.

Height, 36 millimeters; breadth, 19; thickness, 17; height of spire, 11; height of body whorl, 25.

LUZON, Bataan Province, *Bur. Sci.* 11705 Lopez; Moron, *Bur. Sci.* 240 Quadras. CEBU, *Bur. Sci.* 216 Quadras. MINDANAO, Cagayan Province, Salay, *Bur. Sci.* 224 Quadras. Zamboanga Province, Zamboanga and Dapitan, *Hidalgo*. MINDORO, Naujan, *Hidalgo*. BALANACAN, Marinduque Province, *Hidalgo*. Ticao, Masbate Province, and BOHOL, *Cuming*. SAMAR, *Jagor*. BALABAC, *Hidalgo*.

A small specimen with the form of *elegans* and *dentatus* especially in the structure of the aperture, differing only in the shorter spire and the stout body.

STROMBUS ELEGANS Sowerby.

Strombus elegans SOWERBY, Thes. Conchyl. 1¹ (1842) 30, pl. 7, figs. 43, 48; REEVE, Conchol. Icon. *Strombus* 6 (1851) pl. 17, figs. 41a, b; HIDALGO, Cat. Marine Moll. (1904) 135; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 211.

Strombus dentatus var. *eurythrinus* CHEMNITZ in Tryon, Man. Conchol. 7 (1885) 119, pl. 7, figs. 69-71.

Shell elongated; spire rather exserted, transversely striated, faintly elongately ridged, somewhat developed at angle; columella thick; lip somewhat expanded and thickened; interior of aperture purple to warm brown, densely striated; body whitish, dotted or banded with brown.

Height, 33 millimeters; breadth, 16; thickness, 14; height of spire, 13; height of body whorl, 20.

PHILIPPINES, *Bur. Sci.* 13280 Fulton.

Similar to *S. dentatus*, with the shell more elongate and fusiform and the spire generally turreted. The body sculpture is less pronounced, with the shoulder tubercles as low ridges, the longitudinal striae almost entirely gone, and the transverse striations pronounced towards the lip.

STROMBUS RUGOSUS Sowerby.

Strombus rugosus SOWERBY, Thes. Conchyl. 1¹ (1842) 30, pl. 7, figs. 58, 60; REEVE, Conchol. Icon. *Strombus* 6 (1851) pl. 9, fig.

16; HIDALGO, Cat. Marine Moll. (1904) 137; FAUSTINO, Bur. Sci. Monog. 25 (1928) 213.

Strombus corrugatus ADAMS and REEVE, Voy. Samarang (1850) 35, pl. 10, fig. 19.

Shell oblong or elongate-ovate; spire rather exserted; transversely striated, faintly elongately ridged; angles noded; lip somewhat expanded and slightly thickened, sinuated at the anterior part; columella callous; body creamy white, transversely banded with faint flesh strands; interior of aperture faint rusty brown, radiately striated towards the lip.

Height, 26 millimeters; breadth, 12; thickness, 10; height of spire, 10; height of body whorl, 16.

Similar to *S. elegans* in sculpture and easily taken as a smaller variety of that species, differing, however, in being stouter and of lighter color. The only specimen in the Museum's collection, *Bur. Sci. 13083*, was obtained from H. C. Fulton.

STROMBUS SAMAR Chemnitz.

Strombus samar CHEMNITZ, Conch. Cab. 10 (1769-1829) 221, pl. 157, fig. 1503; DILLWYN, Cat. Recent Shells 2 (1817) 674; TRYON, Man. Conchol. 7 (1885) 121, pl. 8, fig. 88; FAUSTINO, Bur. Sci. Monog. 25 (1928) 213.

Strombus tridentatus LAMARCK, Anim. sans Vert 7 (1822) 209, KIENER, Icon. Coq. Viv. Strombus 4 (1843) 64, pl. 26, fig. 2.

Strombus dentatus GMELIN (not Linnæus) in Sowerby, Thes. Conchyl. 1¹ (1842) 31, pl. 9, figs. 86, 87.

Strombus samarensis CHEMNITZ in Reeve, Conchol. Icon. Strombus 6 (1851) pl. 19, figs. 53a, b; HIDALGO, Cat. Marine Moll. (1904) 137.

Shell elongate-ovate; spire exserted, acuminate; whorls convex, longitudinally ridged, smooth, rather unequally gibbous; columella callous, narrow; lip abbreviately expanded, dentated at anterior end; body creamy-white splashed with light-brown wavy streaks or blotches; interior of aperture radiately striated towards the lip, dark chestnut-brown; columella white.

Height, 52 millimeters; breadth, 22; thickness, 19; height of spire, 20; height of body whorl, 31.

PHILIPPINES, *Bur. Sci. 13281* Fulton.

This form is very seldom encountered. It can be easily distinguished by its elongate shape with slightly unevenly swelling whorls and the three lobes at the base of the slightly expanded lip.

STROMBUS BULBULUS Sowerby.

Strombus bulbulus SOWERBY, Proc. Zool. Soc. (1842) 144; Thes. Conchyl. 1¹ (1842) 32, pl. 9, figs. 81-83; REEVE, Conchol. Icon.

Strombus 6 (1851) pl. 6, fig. 8a, b; TRYON, Man. Conchol. 7 (1885) 121, pl. 8, fig. 86; HIDALGO, Cat. Marine Moll. (1904) 134; FAUSTINO, Bur. Sci. Monog. 25 (1928) 211.

Shell subcylindrical, smooth, gibbously swollen, base sulcate; body freckled and oftentimes banded with chestnut; aperture dark purple, finely striated within.

Height, 33 millimeters; breadth, 15; thickness, 13; height of spire, 11; height of body whorl, 23.

MINDANAO, Surigao Province, *Bur. Sci.* 239 *Quadras*.

A species very seldom encountered. The only specimen in the Museum's Cabinet was part of the *Quadras* collection. This form has the general shape of *S. gibberulus*.

STROMBUS TERESELLATUS Sowerby.

Strombus terebellatus SOWERBY, Thes. Conchyl. 1¹ (1842) 31, pl. 9, figs. 84, 85; KIENER, Icon. Coq. Viv. *Strombus* 4 (1843) 66, pl. 18, fig. 2; REEVE, Conchol. Icon. *Strombus* 6 (1851) pl. 6, fig. 10 a, b; TRYON, Man. Conchol. 7 (1885) 121, pl. 8, fig. 87; HIDALGO, Cat. Marine Moll. (1904) 137; FAUSTINO, Bur. Sci. Monog. 25 (1928) 213.

Shell elongated, thin, smooth; spire exserted; whorls rounded, alternately gibbously swollen; columella narrow; lip slightly expanded, somewhat truncated at anterior part; body yellowish, mottled with wavy reddish-brown streaks; interior of aperture white, very faintly radiately striated.

Height, 33 millimeters; breadth, 11; thickness, 10; height of spire, 14; height of body whorl, 19.

MARINDUQUE, Boac, Laylay, *Bur. Sci.* 773 *Quadras*.

An elongate, thin, smooth shell, having the form of *terebellum*, with the lip truncated anteriorly.

Genus ROSTELLARIA Lamarck

Shell fusiform, somewhat turreted; base extended into an acute rostral canal; lip rather broad, entire or dentate; posterior canal usually short, ascending and closely applied to spire.

Key to the Philippine species of Rostellaria.

- a*¹. Shell large, whorls smooth.
 - b*¹. Anterior canal short, straight *R. martini*.
 - b*². Anterior canal long *R. fusus*.
- a*². Shell small; whorls plicated.
 - b*¹. Posterior canal long, decumbent *R. fissurella*.
 - b*². Posterior canal short, curving outward *R. crispata*.

ROSTELLARIA MARTINI Marrat.

Rostellaria martini MARRAT in Tryon, Man. Conchol. 7 (1885) 128, pl. 11, fig. 34; HIDALGO, Cat. Marine Moll. (1904) 139; FAUSTINO, Bur. Sci. Monog. 25 (1928) 215.

Shell fusiform, spire exserted, acuminate; whorls smooth, rounded; columella callous, arched; lips slightly expanded, 7-dentate, conspicuously channeled above but not reaching first suture; anterior canal short, straight, light yellowish brown; interior of aperture white.

Height, 137 millimeters; breadth, 47; thickness, 37; height of spire, 57; height of body whorl to tip of canal, 80.

MARINDUQUE, Masiga, Bur. Sci. 944 Quadras.

This is the largest species of *Rostellaria* in the Philippines. The museum's specimen is probably the one referred to in Hidalgo's report.

ROSTELLARIA FUSUS (Linnæus).

Strombus fusus LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1207; DILLWYN, Cat. Recent Shells 2 (1817) 654.

Rostellaria rectirostris LAMARCK, Anim. sans Vert. 7 (1822) 192; KIENER, Icon. Coq. Viv. Rostellaria 4 (1843) 5, pl. 2, fig. 1.

Rostellaria rectirostrum LAMARCK in Sowerby, Thes. Conchyl. 1¹ (1842) 22, pl. 5, figs. 8, 10.

Rostellaria fusus LINNÆUS in Reeve, Conchol. Icon. Rostellaria 6 (1851) pl. 2, fig. 5; TRYON, Man. Conchol. Icon. 7 (1885) 128, pl. 10, fig. 17; pl. 11, fig. 21; HIDALGO, Cat. Marine Moll. (1904) 139; FAUSTINO, Bur. Sci. Monog. 25 (1928) 214.

This species very closely resembles *R. martini*, differing only in being slender, with the anterior canal very much longer. There is no specimen in the museum's collection, and the writer had no opportunity to examine one. This species was reported by Hidalgo from Lubang Island, Mindoro Province, and from Balugo, Marinduque.

ROSTELLARIA FISSURELLA (Linnæus).

Strombus fissurella LINNÆUS, Syst. Nat. ed. 12 1² (1767) 1212; DILLWYN, Cat. Recent Shells 2 (1817) 672; SOWERBY, Thes. Conchyl. 1¹ (1842) 26, pl. 8, figs. 64, 65.

Rostellaria fissurella LINNÆUS in Lamarck, Anim. sans Vert. 7 (1822) 194.

Strombus cancellatus LAMARCK, Anim. sans Vert. 7 (1822) 212.

Rostellaria cancellata LAMARCK in Kiener, Icon. Coq. Viv. Rostellaria 4 (1843) 9, pl. 3, fig. 3; REEVE, Conchol. Icon. Rostellaria 6 (1851) pl. 3, fig. 10; TRYON, Man. Conchol. 7 (1885) 129; HIDALGO, Cat. Marine Moll. (1904) 139; FAUSTINO, Bur. Sci. Monog. 25 (1928) 214.

Shell fusiform; spire turreted; whorls longitudinally plicated, spirally striated; aperture oval; posterior canal running up and closely applied to spire; lip slightly expanded, thickened-crenulate, faintly radiately striated within; columella callous, thickened; body yellowish brown, often banded with fawn; columella and interior of aperture white.

Height, 37 millimeters; breadth, 15; thickness, 11; height of spire, 17; height of body whorl, 20.

CEBU, *Bur. Sci.* 10898 *Quadras*. MINDANAO, Zamboanga, *Bur. Sci.* 15279 *Domantay*, *Bur. Sci.* 15280 *Casey*. In Zamboanga dredged in sandy-muddy bottom at 6 fathoms.

This form is slightly larger than *R. crispata*, and a bit more compressed, with the posterior canal gently rising and sliding backwards. These two species were placed by Tryon under the subgenus *Rimela*.

ROSTELLARIA CRISPATA (Sowerby).

Strombus crispatus SOWERBY, *Thes. Conchyl.* 1¹ (1842) 26, pl. 8, figs. 62, 63; *Proc. Zool. Soc. London* (1842) 143.

Rostellaria crispata SOWERBY in Kiener, *Icon. Coq. Viv. Rostellaria* 4 (1843) 10, pl. 4, fig. 12; REEVE, *Conchol. Icon. Rostellaria* 6 (1851) pl. 3, fig. 82 b; TRYON, *Man. Conchol.* 7 (1885) 129, pl. 10, fig. 19; HIDALGO, *Cat. Marine Moll.* (1904) 139; FAUSTINO, *Bur. Sci. Monog.* 25 (1928) 214.

Shell fusiform; spire turreted, acuminate; whorls spirally striated, longitudinally plicated; aperture oval, posterior canal short, running up and sharply curving outwards; lip slightly expanded, somewhat thickened and crenulate at margin; columella callous, slightly curved; body yellowish brown with stripes or blotches of rusty brown; interior of aperture chestnut; columella and lip white.

Height, 22 millimeters; breadth, 10; thickness, 7; height of spire, 9; height of body whorl, 13.

CEBU, *Bur. Sci.* 2401 *Quadras*. MINDANAO, Zamboanga Province, Dapitan, *Bur. Sci.* 777 *Quadras*.

This species is very much smaller than the preceding one, of deeper body color, and with a short, sharply curved, posterior canal.

Genus SERAPHS Montfort

Shell elongate, subcylindrical; spire short; body whorl prominent, smooth; aperture elongate, narrowing posteriorly. Lip simple, thin.

SERAPHS SUBULATUM (Lamarck).

Terebellum subulatum LAMARCK, Anim. sans Vert. 7 (1822) 410; Zool. Voy. Samarang (1850) 36, pl. 9, fig. 6; SOWERBY, Thes. Conchyl. 3 (1866) 80, pl. 218, figs. 4, 5; TRYON, Man. Conchol. 7 (1885) 131, pl. 11, figs. 27-30.

Seraps subulatum LAMARCK in Faustino, Bur. Sci. Monog. 25 (1928) 214.

Terebellum punctatum CHEMNITZ in Reeve, Conchol. Icon. Terebellum 14 (1864) pl. 1, figs. 1a-g; HIDALGO, Cat. Marine Moll. (1904) 140; FAUSTINO, Bur. Sci. Monog. 25 (1928) 214.

Shell elongate, subcylindrical, thin, smooth; spire short; body whorl very large; aperture elongate, narrow posteriorly, somewhat dilated anteriorly, anterior end truncate, lip simple, thin columella slightly callous, straight; body white, variegated with reddish-brown specks or dots.

Height, 55 millimeters; breadth, 13; thickness, 11; height of spire, 12; height of body whorl, 43.

LUZON, Tayabas Province, Catanauan, Yuni, *Bur. Sci.* 14640 Navarro. MARINDUQUE, Boac, Laylay, *Bur. Sci.* 991 Quadras. SAMAR, Catbalogan, *Bur. Sci.* 12804 Schenck. MINDANAO, Zamboanga Province, Zamboanga, *Bur. Sci.* 15281 Casey. PALAWAN, Bacuit, *Bur. Sci.* 12058 Merin, Cinco, and Worin.

In general form the shell of this species seems to have no affinity with the other members of the family. The connection was established only on collecting and observing live specimens. The animals show the same anatomical details and behavior.

